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February 1958

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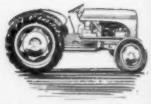

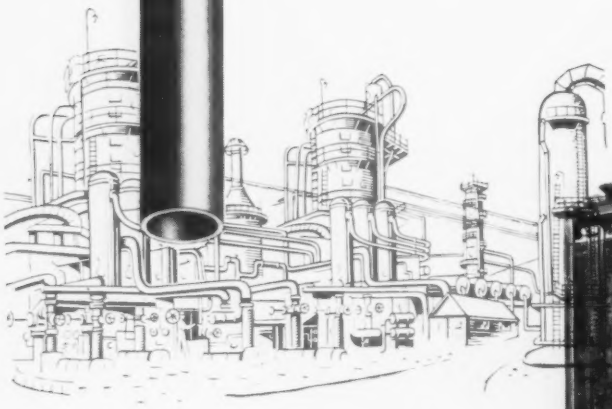

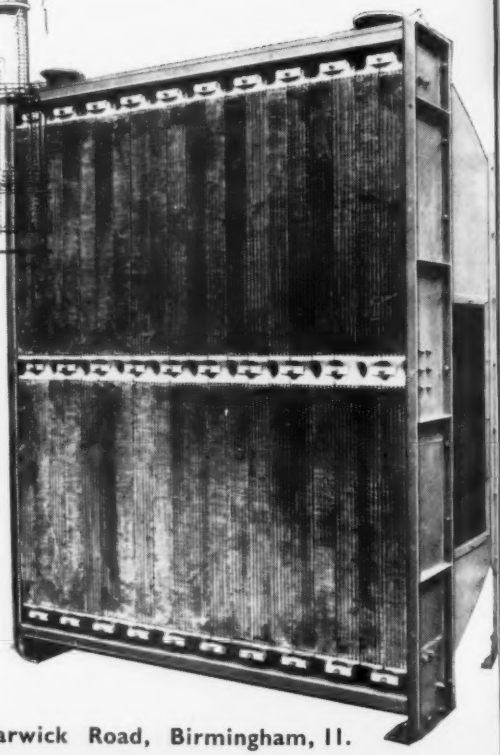

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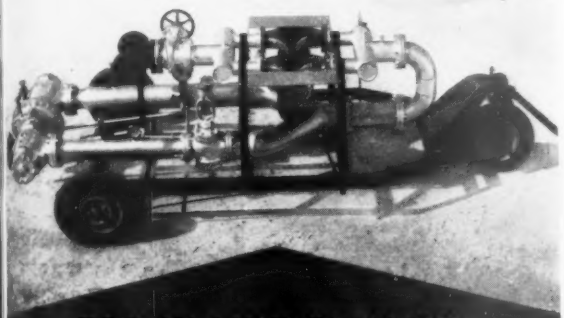

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REVIEW

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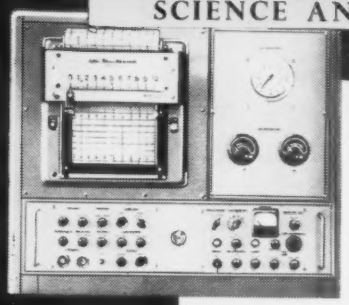
SCIENCE AND THE STEEL TUBE AGE : 2



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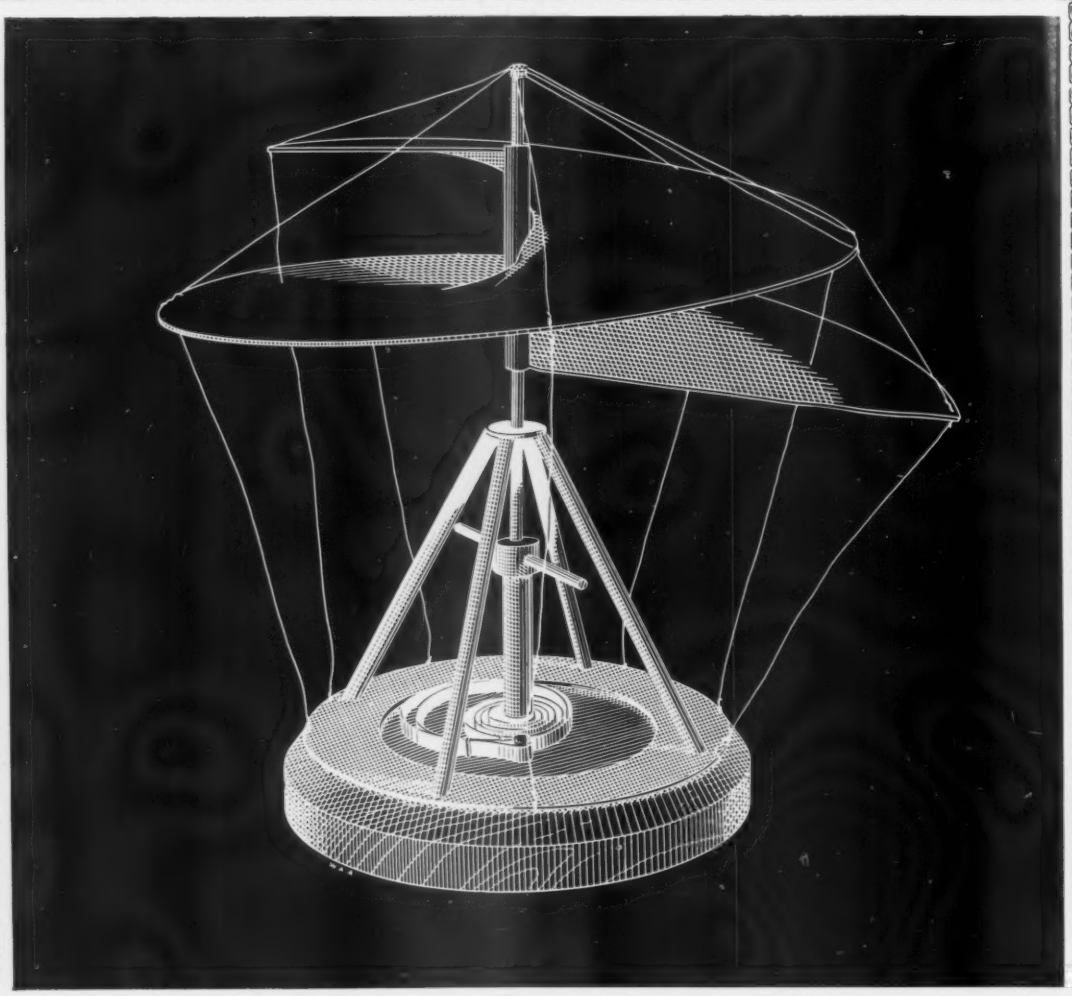

From a Science Museum Photograph.

A flying machine for the Borgias

During 1502 Cesare Borgia employed Leonardo da Vinci as his military engineer. But not until this century have the full potentialities of Leonardo's designs been appreciated. With greater resources of power at his disposal there is no knowing what technical advances he might have achieved. During his lifetime the soaring imagination behind such inventions as this helicopter was frustrated by the tug of gravity and the grip of friction. To overcome the one, power was needed; to overcome the other, lubricants. It was not until 250 years after Leonardo's death that men began to utilise the power that lies in coal, and another 100 years passed before the immense possibilities of mineral oil for power and lubrication were discovered. Vacuum Oil Company — now Mobil Oil Company — was founded in 1866, only seven years after the sinking of the first commercial oil well. During the succeeding 91 years the company has pioneered many of the technological advances that have made Leonardo da Vinci's dreams into modern common-place. Today, Mobil products are known and used throughout the world, setting the standard of quality for products of their kind.

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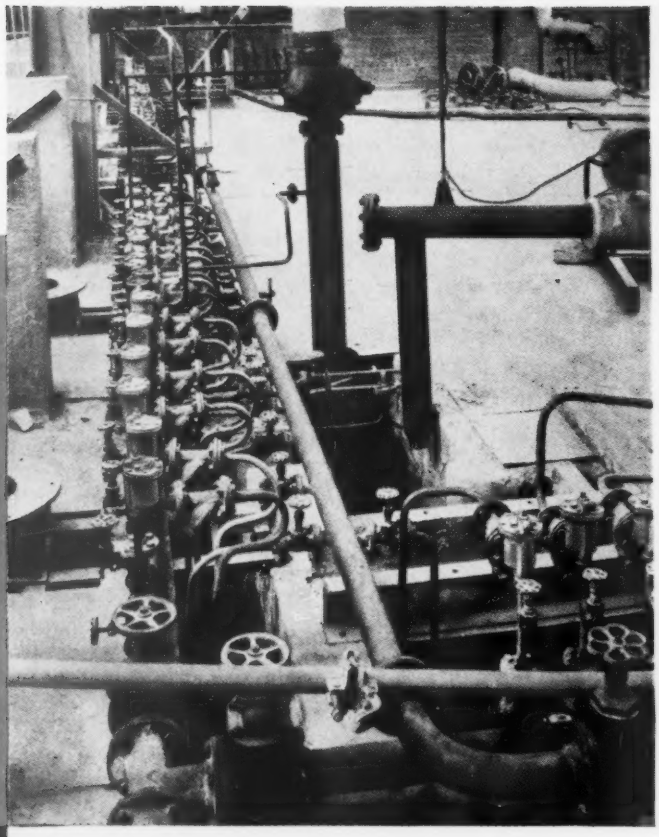

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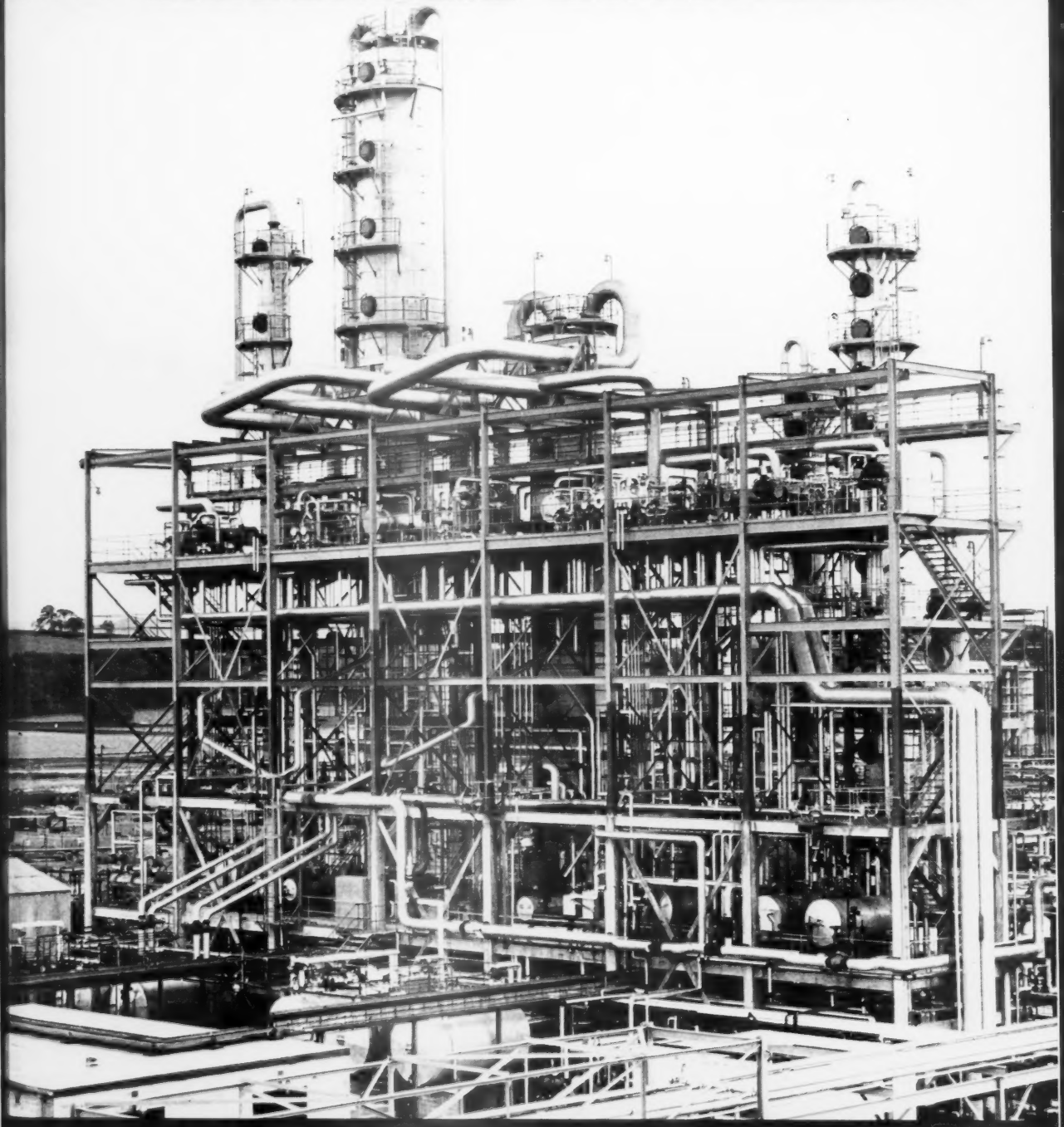

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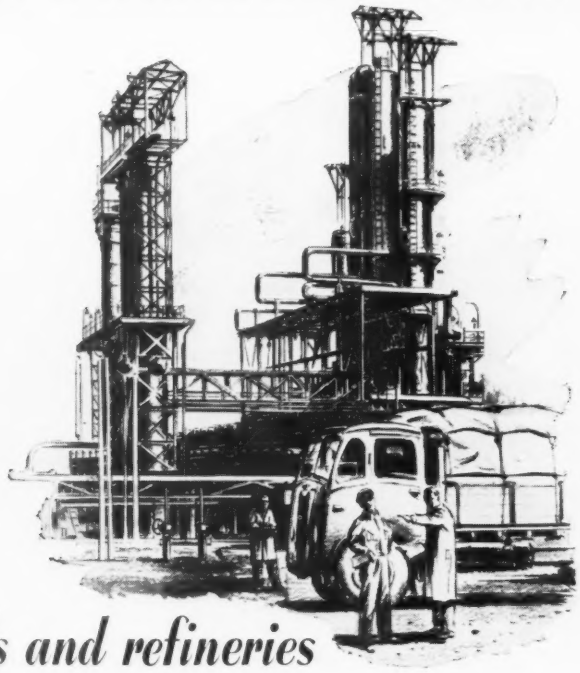

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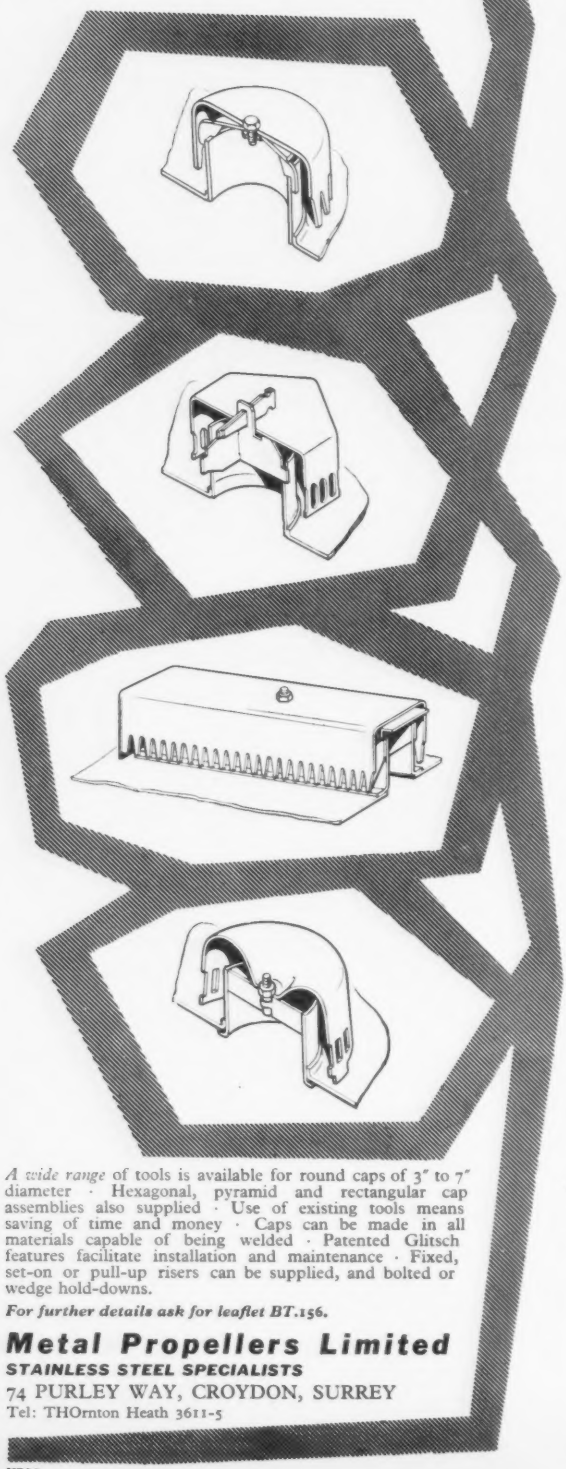

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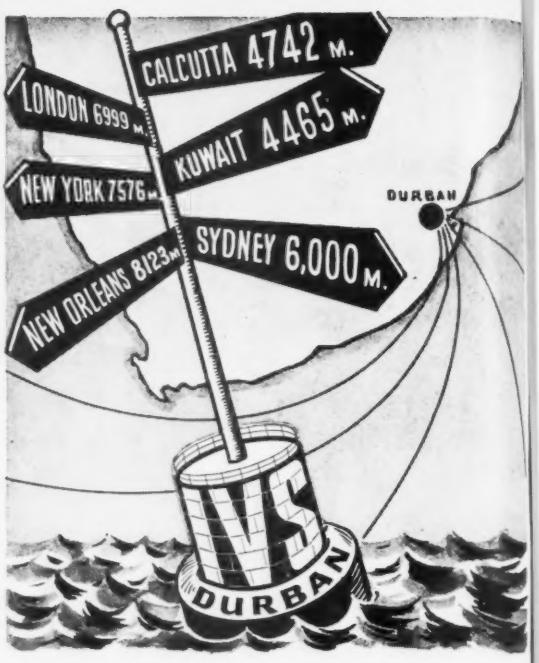

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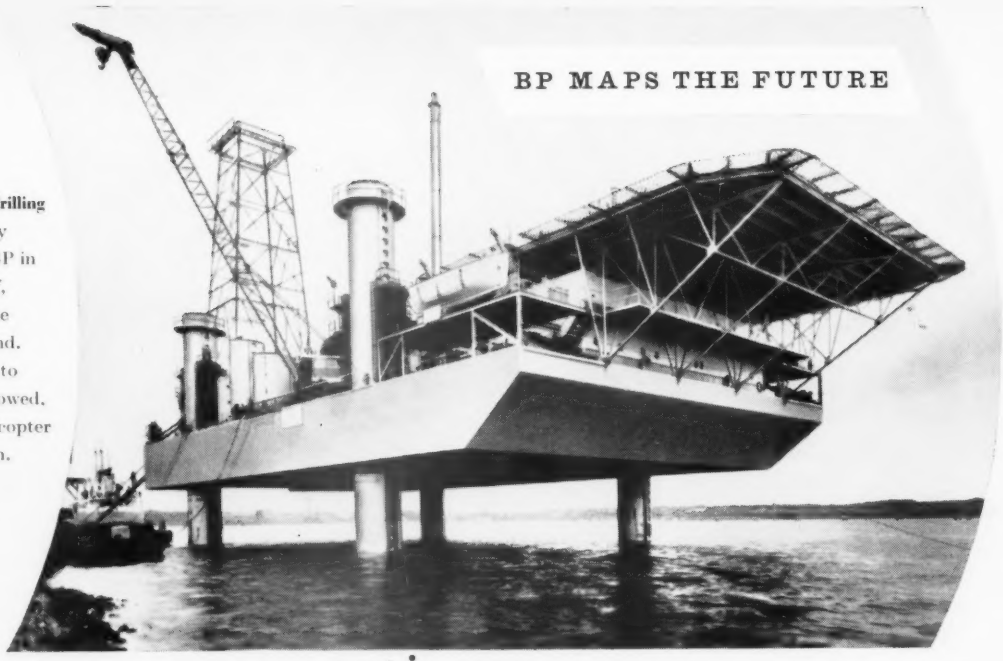
BP MAPS THE FUTURE



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Can oil supplies be doubled in the next ten years?

TODAY THE WORLD is using twice as much oil as in 1946. So far, production has kept pace with demand. At its expected rate of increase, by 1966 demand may well have doubled again. What is being done to meet this situation?

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In 1946 the world used some twenty million tons of BP products; in 1956 fifty-three million.

The ever-increasing demand for oil must be met: no organisation in the world is working harder to meet it than The British Petroleum Company.

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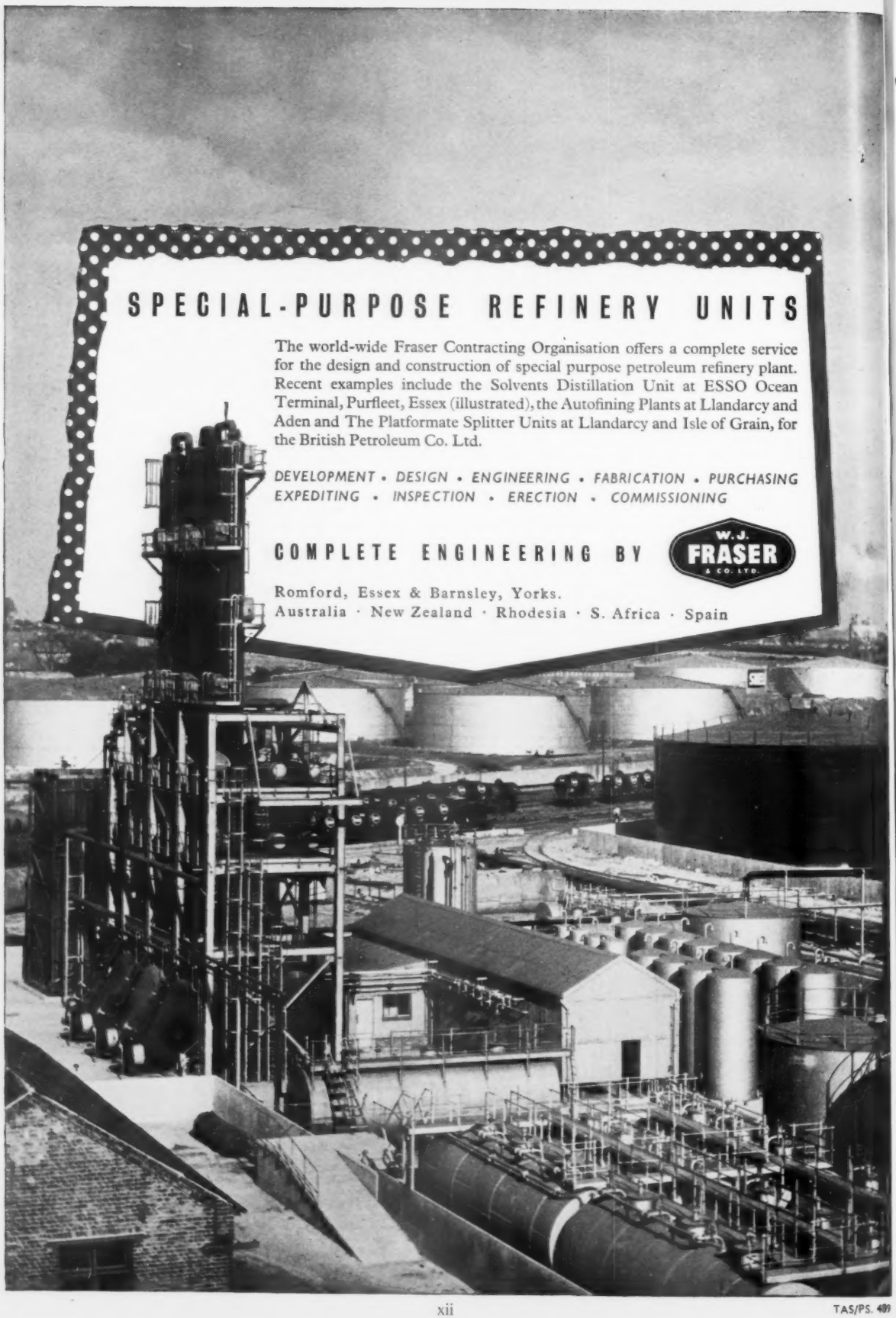
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REVIEW

Volume 12, No. 134 February 1958

Honorary Editor: E. B. EVANS, M.SC., PH.D., F.R.I.C. *Hon. Associate Editor:* D. L. SAMUEL, B.SC., A.R.I.C. *Editor:* GEORGE SELL

The President Visits Branches in the Persian Gulf

During December last, the President of the Institute, the Right Honourable Lord Geddes, and Lady Geddes, took the opportunity, during a world tour, of visiting the Institute Branches in Kuwait and in Bahrain. During part of these visits they were accompanied by the editor of the IP publications. At each of the Branches the visitors were given an enthusiastic welcome.

The Kuwait Dinner

The first official function which Lord Geddes attended was the 1957–58 Annual Dinner of the Kuwait Branch, held on 16 December in the Guest House at Ahmadi. The dinner was presided over by A. L. Smither, Branch chairman, and over one hundred members and guests were present.

Among the guests were C. A. P. Southwell, C.B.E., a past-president of the IP and managing director of the Kuwait Oil Company; H.E. the American Ambassador to Iraq, Waldemer J. Gallman; H.M. Political Agent in Kuwait, Aubrey S. Halford; Admiral H. M. Briggs, Commander U.S. Navy, Middle East Force; N. B. King, Economic Counsellor to the U.S. Embassy in Iraq; Talcott Seelye, American Consul in Kuwait; Dr Eric Parry, Chief Medical Officer in Kuwait; George Sell, editor of IP publications; W. H. Cotter, chairman of IP Bahrain Branch; D. C. Wilkins and J. N. Newman, Qatar Petroleum Company; and W. H. Gerhardt, project manager for Kuwait Refinery Expansion Project.

Proposing the toast "The Oil Industry", The Honourable Waldemer J. Gallman, the American Ambassador to Iraq, said that he greatly appreciated the friendly reception which he had received and expressed his pleasure at being present at the dinner of the IP Kuwait Branch. He considered himself an oilman as he was born and brought up in the town of Wellsville, which was not far from the site of the Drake well. His grandfather, he said, had skimmed oil from the surface

At the commencement of their visit to the IP Branches in the Persian Gulf, Lord and Lady Geddes were met at Kuwait Airport by (left) *A. L. Smither (chairman of the IP Kuwait Branch), E. Boaden (deputy general manager, Kuwait Oil Company), C. A. P. Southwell (managing director, Kuwait Oil Company), and* (right) *L. T. Jordan (general manager, Kuwait Oil Company)*

of water and his father had had to do a bit more to get oil, but in Kuwait all one had to do to get oil was to push a finger into the sand.

Continuing, Mr Gallman said that co-operation between the United Kingdom and the United States was in the best interests of the whole free world. He was happy to find that in Kuwait there was such close collaboration between British and American personnel.

A prosperous petroleum industry would lead to comfort in daily life and economic security, concluded Mr Gallman.

Responding to the toast, C. A. P. Southwell assured his audience that although he found many changes in Kuwait, their car-parking problems were no different from those found in London.

Paying a tribute to the work of the staff in Kuwait, which he said was magnificent, Mr Southwell said they were fortunate in working in a country where co-operation with their Arab friends was a great success, and Kuwait was fortunate in having a wise ruler. As a result also of British-American co-operation there was available to the State of Kuwait the best technical oil experience from all parts of the world. In the field of human relations, all oilmen were ambassadors in the making of good friendships and the Company could be proud of its achievements in that matter.

Concluding, Mr Southwell said that the petroleum industry should do more in the direction of telling the world of its achievements in all its spheres of activity.

The toast "The Institute of Petroleum" was proposed by A. S. Halford, Her Majesty's Political Agent in Kuwait. He said that the oil industry of Kuwait was of vital importance to the whole world. One only had to live with the oil industry from day to day to realize its impact on life and its ramifications. The industry had certainly progressed a long way since the days when oil was sold only as a lamp fuel.

Too few people outside the oil industry realized that the initial winning of the oil from the ground was only the first of many stages, each of which was itself a complicated and highly technical business. It was difficult for one man, even in the oil industry, to realize its full scope and there was a danger of getting into watertight compartments.

The Institute of Petroleum satisfied the need for men to meet and to exchange ideas, said Mr Halford. The desire to get together to discuss problems and to exchange ideas was at the root of any industry. As long ago as 1913 the leaders of the oil industry had recognized that need and he congratulated the Institute on its success and achievements.

Acknowledging the toast, The Right Honourable Lord Geddes, President of the Institute, referred to the activities and to the future of the Institute. The full text of his speech is given in the article below.

The toast "The Guests" was ably proposed by A. L. Smither, and replied to by Dr E. Parry, O.B.E., in a witty and appropriate speech.

At Bahrain

On 18 December Lord and Lady Geddes were guests of honour at a luncheon given by M. H. Lipp, resident vice-president in Bahrain, and W. A. Schmidt, general manager, on behalf of The Bahrain Petroleum Company Ltd. This luncheon was held in the Company's guest house at Awali and was attended by representatives of the Ruler and of the Government.

In the evening the Bahrain Branch of the IP held a special meeting, which was addressed by the President. The address was similar to that which he gave to the Kuwait Branch.

This meeting concluded with a Cocktail Party at which Lord and Lady Geddes and the editor were guests.

*The Institute of Petroleum**

Its Past, Present, and Future

By **The Rt Hon LORD GEDDES, C.B.E. (President)**

You all know about Topsy whose chief claim, and indeed whose only claim, to fame was that she just growed and growed. That simply is the history of the Institute of Petroleum.

However, as President of your Institute, I realize that as a report of the Institute's activities over nearly forty-five years, this is hardly a comprehensive review of its development. In my survey of what has been done in the past, and what we hope to do in the future, I am sure that you will realize that this growth was not accidental, and was only accomplished by means of a great deal of foresight and hard work by many people.

The oil industry was thriving before the turn of the century, but the chief use of oil in those days was for lamps, and the main interest, at least in Great Britain, was in the buying and selling of it, rather than in delving into its technology. In the early years of the 20th century, however, the arrival of the motor-car changed all that, just as thoroughly as it has changed the entire face of the civilized world. The very fact that the early machines were unreliable threw out a challenge to the oil industry to provide the fuels and lubricants that would give the most efficient performance, and in a very short time the technologist had come to stay.

It was not long before it became clear that there was a need for some sort of co-ordination between the different forms of technological work. As far as Great Britain was concerned this need was emphasized by the Royal Commission which sat in 1912 under the chairmanship of Admiral Lord Fisher to study the problems of utilizing petroleum in the Royal Navy. At this Commission it became obvious that whilst some of the foremost scientists of the day could express

*Text of an address given to the Kuwait and Bahrain Branches of the Institute during December 1957

At the Kuwait Dinner

Lord Geddes replying to the toast "The Institute of Petroleum"

A. L. Smither proposing the toast "The Guests"

Admiral H. M. Briggs (Commander, U.S. Forces in the Middle East), J. M. Dougary (Kuwait Oil Company), and Lord Geddes

Nat B. King (Economic Counsellor, U.S. Embassy, Baghdad), W. C. Buie and R. A. D. Winter (Kuwait Oil Company), and W. H. Cotter (chairman, IP Bahrain Branch)

D. G. Hitt, Lord Geddes, D. S. Curtis (deputy chairman, IP Kuwait Branch), A. L. Smither (chairman, IP Kuwait Branch), W. J. Gallman (U.S. Ambassador to Iraq), A. S. Halford H.M. Political Agent in Kuwait), Admiral H. M. Briggs, T. W. Seelye (U.S. Consul in Kuwait), and C. A. P. Southwell (managing director, Kuwait Oil Company)

C. A. P. Southwell, Admiral H. M. Briggs, T. W. Seelye, L. T. Jordan (general manager, Kuwait Oil Company), George Sell, and Lord Geddes

views regarding engineering, refining, transport, and storage, each had comparatively little understanding of the problems facing his fellow scientists, and there was negligible co-ordination between the various fields of petroleum technology.

Foundation of the Institute

In 1913, therefore, a group of men, under the leadership of Sir Boverton Redwood got together to discuss what to do, and as a result they founded the Institution of Petroleum Technologists, with the main object of enabling technologists in the various fields and of all nations to meet, and to correspond on problems related to petroleum.

Here I should perhaps pause for a moment in this historical review to emphasize that the Institution of Petroleum Technologists differed fundamentally from such learned bodies as the Royal Institute of Chemistry, and the Institutions of Mechanical, Electrical, and Civil Engineers in that the Institution of Petroleum Technologists was conceived to embrace all the technological fields of a complex industry and not to specialize in any one of them. In other words, its purpose was to supplement and, within the petroleum industry, to co-ordinate their functions, rather than to compete with them. For this reason, although membership and fellowship was granted only to those men and women who had shown proficiency in the oil industry, the Institution of Petroleum Technologists was not conceived to be a qualifying body as are those other societies.

The First Branch

After the 1914–1918 war the Institution prospered and its membership rose steadily towards the two thousand mark, and then in 1926 there occurred an event of great importance in its history; the Council of the Institution approved the formation of the first overseas Branch—the Roumanian Branch. Although as I have said there had never been a restriction as to nationality, the opening of the Roumanian Branch confirmed for all time the unlimited international scope of the Institution. Now nearly one-third of the Institute's membership lives outside Great Britain, and to keep such a Branch as yours running as well and as enthusiastically as it obviously does run has required a great deal of spare-time work from many people, and the Institute is indeed fortunate that there is such interest and enthusiasm for the work that it is trying to do. I can assure you that the work which this and other overseas Branches do in providing the same sort of activities as those enjoyed by members living within reach of the headquarters in London is valuable far beyond the Branch itself. More than that, however, it seems to me that it is in organizations such as this, perhaps even more than in the more formal International Bodies, that there lies the real hope for international understanding for the future. The men and women of the oil companies have shown that it is possible for people who are different in race, creed, and colour to work harmoniously together. I believe that it is of the utmost importance to the future of civilization that each of us should do what he can to foster this co-operation. I do not think that it is an exaggeration to say that world peace is more likely to grow *upward* from roots of personal understandings in organizations such as this (which are free of the bonds of national frontiers) than *downward* from the often unripe theories at the tops of the trees.

Achievements and Aims

I come now to the question—just what is the Institute trying to do and what has it achieved in the past? Its main object in its *Memorandum* stated that it was founded to enable all engaged in the petroleum industry to meet and correspond and to promote the study of all aspects of petroleum and its products, and for over forty years that is exactly what it has been doing; the standard of the papers and discussions has been sustained at a very high level, and ever since the Institute started, every paper read before it has been published in the *Journal*, which now has a circulation of over five thousand copies per month.

Each Branch, and there are now twelve of them, provides a forum for the discussion of petroleum problems among members who live too far from headquarters to attend the meetings there. You will, I am sure, agree that in the technological field the Institute is meeting and fulfilling its responsibilities and obligations. Further than this, however, in the general commercial field your Institute has played, and is playing, a most important part in producing authoritative data which could not be produced by any single company.

One aspect of the Institute's work which I thought might interest you is the standardization side.

Standardization

The chief object of the Standardization Committee is the annual publication of "Standard Methods for Testing Petroleum and Its Products", which is used all over the world. The Standardization Committee which controls this work is made up of members of Council, representatives of

Following the meeting of the Bahrain Branch, the IP editor was entertained to dinner by the Branch Committee and others and took the pictures reproduced above. Left to right *are: Mrs Gardiner, Dick de Mestre, Mr Benn, Mrs de Mestre, Mr Sprange, Mr Goldburn, Neville Pocock, Mrs Goldburn, Mr Van de Platz, Mrs May, Mr Gardiner, Mrs Baker, John May, Rod Smith, Mrs Benn, Mrs Newman, G. Beeby Thompson, Mr Newman, Mr Wheatley and Mr Wilkins*

oil and equipment companies, the services, the civil service, and foreign organizations. Stemming from this committee are fifteen sub-committees covering every aspect of the oil industry, and each sub-committee has a number of panels and working groups, totalling the best part of a hundred.

When an organization, very often one of the larger companies or a manufacturer, finds that an existing method of test has become out of date, or some development or new discovery necessitates the use of new apparatus, the request for a new method is passed from the Standardization Committee to the appropriate sub-committee. Here it is discussed, and if a change is thought to be justified the request is referred to a panel of experts for a draft method to be devised.

A very considerable amount of experimental work is then carried out in the laboratories of the various companies represented on the panel, the results are collated, and a draft method is prepared and submitted to the sub-committee. Often the sub-committee is not quite satisfied with certain points of the test and back it goes again to the panel for further experimental work until the sub-committee is satisfied and approves the draft.

G. Beeby Thompson, immediate past-chairman of the Branch, with Neville Pocock, Planning Department, and Dick de Mestre

It is then recommended to the Standardization Committee and from there it is passed to Mr Sell's Editorial Sub-Committee, who put it into a standard form to be published as a standard method in the next edition of "Standard Methods".

All this time the British Standards Institution is kept closely informed, and in many instances it adopts the Institute's standard methods as British Standards. A very close contact, at all levels, is also maintained with the American Society for Testing Materials.

The Technical Department also looks after the work of the Engineering Committee.

Codes of Safe Practice

The main work of this Committee is the production of the Institute's Codes of Safe Practice. So far the Electrical, Marketing, Refining, and Drilling and Production codes have been published and at present the Committee are working on a Tanker Code.

The present Tanker Code arose from the pressing need

At the Bahrain Branch party, Lord Geddes discusses a point with Charles Davis, Bapco production manager, and Dick de Mestre, petroleum engineer

amongst the smaller tanker companies for an authoritative and uniform code that would cover safety precautions under such headings as the transfer of petroleum from ship to ship and ship to shore, packaged cargoes, and cleaning operations at sea.

Publications

Perhaps the most important field in which the Institute engages, and the one most interesting to its members, is the publication of its periodicals. A wide range of books and periodicals dealing with the whole field of petroleum activities is published each year. One of the main objects for which the Institute was founded was the dissemination of knowledge, and I think the founders of the Institute would have been very proud if they could have foreseen the growth in the Institute's publications, both in quantity and quality over the past forty years.

Undoubtedly the best known of these publications are the monthly *Journal* and IP *Review*. The *Journal* was first issued as an irregular publication in 1914, but it was not long before it became a monthly periodical and established itself as one of the leading scientific periodicals.

Bob Craig, Electrical Division, Mr and Mrs Parker, and Mrs Craig

More at the Bahrain party: Jim Southwell, assistant general manager, Engineering and Technical Services, Walt Schmidt, general manager, and Brian Harris, Engineering Department—

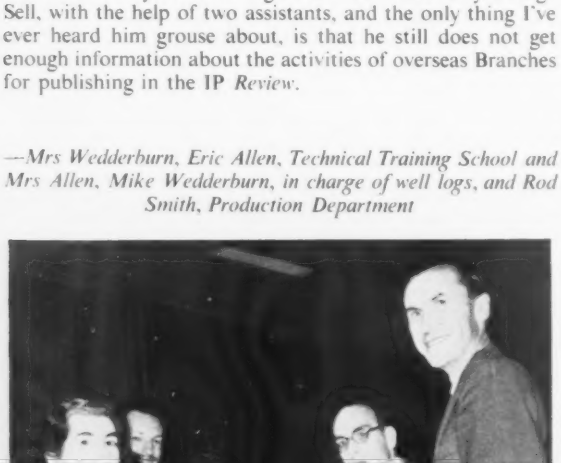
Its abstract section, condensed from scientific journals from all over the world, is used by scientists and technologists in pretty nearly every country.

The IP *Review* is a comparative new-comer, but it already has a circulation of over 5000 copies a month, and I think you will agree that the decision to double its page size has greatly improved the publication.

The work of publishing these monthly periodicals and books—there are 23 books on sale at the moment—is controlled by the Publications Committee through three of its sub-committees—Papers, Publications Costing, and Abstracts.

All the very considerable work of this publishing business—and that is really what it has grown to be—is done by George Sell, with the help of two assistants, and the only thing I've ever heard him grouse about, is that he still does not get enough information about the activities of overseas Branches for publishing in the IP *Review*.

—Mrs Wedderburn, Eric Allen, Technical Training School and Mrs Allen, Mike Wedderburn, in charge of well logs, and Rod Smith, Production Department



Council Committees

I have sketched out, very roughly and with many omissions, the work done by three of the Council Committees of the Institute.

Altogether there are fourteen Council Committees, but I will only deal now with the activities of one other of them, because its deliberations particularly affect this Branch, and that is the Branches Committee.

This Committee consists of three or four members of Council, and the chairman and honorary secretary of every Branch, both at home and overseas.

The Committee meets twice a year, with the home Branches taking it in turn to be hosts. Every overseas Branch is invited to attend these meetings, and if an officer of the Branch is not available then any member of the Branch Committee could act as substitute. I do hope that your Branch can manage to be represented at these meetings in the future. Your representative, I can assure you, would receive a great welcome. Council feels very strongly that the voice of the overseas Branches should be heard in the affairs of the Institute, and although Professor Morton is specially nominated by the Branches Committee to be, if I may use a parliamentary expression, the Branches' Member, there is nothing like personal contacts.

The Future

From all these achievements, and the steady increase in the membership, both corporate and company membership, I can report with sincerity and satisfaction not only that your Institute is prospering but that we have only seen the beginning of its growth. In 1939 when Col. S. J. M. Auld was for the first time President of the Institute, its name was changed from "The Institution of Petroleum Technologists" to "The Institute of Petroleum". This was however more than just a change of name, for it was the outward sign of a decision that, as well as catering for the needs of the scientists and technologists, the Institute would henceforth open its doors to all engaged in the petroleum industry, from the administrator to the accountant, and from the statistician to the sailor. Unfortunately, no sooner had the change been made, than the second world war burst upon us, and the whole plan for the development of the Institute went into cold storage for the duration.

Immediately after the war the industry found itself faced with a very rapid expansion and it was almost literally a case of all hands to the pumps, and so for some years it remained difficult to find the right man with the time available to guide the Institute in its evolution. Obviously something had to be done to attract such men, and the first step towards the widening of the Institute was the launching of the IP *Review* to which I have referred. The next effort in the direction of widening the Institute was the creation of the Economics and Operations Group. Some extremely important papers have been read and discussed before this Group, and subsequently published in the IP *Review*.

There is one further step which is being taken to make the Institute more flexible. The structure of its Council has remained largely unchanged for many years. There is to be put forward a series of resolutions the object of which is both to reduce the size and to accelerate the turnover of the membership of Council. We feel that more frequent additions of new blood on that body will be beneficial to the Institute.

There is, I am sure, much more that the Institute could do to make the petroleum industry better known outside itself, particularly in schools and universities, and it may be that

there is scope for increased activity in the general field of public relations. Such matters are constantly under review.

The New Headquarters

On 28 November, the Institute of Petroleum moved into its own Headquarters for the first time, and was honoured by the ceremony of the opening of the building being performed by the Minister of Power, the Rt. Hon. Lord Mills.

The building itself was built by the Adam brothers in the 18th century. The Institute is grateful for the help of all those companies and individuals who made it possible to acquire and fit out this building, and accepts the challenge that from these new premises it can extend the service which it provides both to the Industry, and particularly to its own members. There is room for expansion, and whenever and wherever there are problems in which the Institute can be of service to the industry, that service will always be given to the utmost of its ability.

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The Outlook for Oil

Speaking at a luncheon in Liverpool recently, E. LeQ. Herbert, managing director, Shell Refining Co. Ltd, stated that during the first half of this century world consumption of commercial energy fuels had grown at an annual rate of about 2 per cent compound, and the world was now consuming nearly three times the amount it used in 1920. During that time the contribution made to world needs by coal, oil and natural gas, and hydro-electricity had changed radically. In 1920 coal was still the world's largest source of energy, accounting for over 84 per cent, measured in terms of effectively used energy. In 1957 this had fallen to 44 per cent. Hydro-electricity's share increased slightly and now provided about 6 per cent; oil's share however rose from 14 per cent in 1920 to 50 per cent at present.

Energy consumption in the Free World might grow at a long-term annual average rate of about 3 per cent, and even if the coal industry throughout the world maintained a significant increase over its present production, the oil industry would have to meet the major demands. He did not consider that atomic energy would make a substantial contribution until the late 1960s.

The future energy requirements of Western Europe alone were estimated by the Hartley Commission, set up by OEEC, to increase by about 70–75 per cent in 1975 compared with 1955. This meant an extra 500 to 600 million tons of coal equivalent, most of which would have to be met by oil. The Commission also estimated the contribution of atomic power in 1975 at 8 per cent of total requirements. By 1975 there would be a gap between demand and indigenous production of energy in Europe of between 350 and 550 million tons of coal equivalent.

The oil industry was aware of the needs and was currently exploring with teams of geologists and drillers in areas as far apart as New Guinea and the Gulf of Mexico. In 1956 about 50 per cent of total oil produced in the Free World came from within the United States; of the rest nearly half was from the Middle East, and about a third from Venezuela, and it was likely that these areas would continue to be the main sources of production. The Caribbean, the Far East, and Canada were increasing production, but main supplies would still be drawn from the Middle East which at present provided about 70 per cent of European needs.

One of the key factors in meeting the growth of oil consumption was transport. Even in 1956 more than 500 tankers had entered the Mersey with more than 6½ million tons of crude oil.

Mr Herbert, after stating that the supply of oil from the Middle East could be described as an exercise in transport, continued:

"Every member of the oil industry is currently studying the vast programme of expansion in its carrying capacity required to handle the growing volume of oil. The various programmes embrace pipeline projects in the Middle East and Europe and a large increase in tanker fleets with an emphasis towards the much larger tankers especially for carrying crude oil with the economies of size it can offer. But the impact of the super-tanker will create its own problems, not the least of which is the need for suitable berthing and dry-docking facilities, inadequate at the present time. And in this connexion I can tell you that over the past year or so the Shell Refining Company has been developing with the Mersey Docks and Harbour Board a project for the building at Tranmere of two large floating stages to accommodate, at each stage, a fully-loaded super-tanker of up to 65,000 tons, and even larger vessels if necessary on a restricted draught. This project with its associated tankage, pumping facilities, and pipeline to Stanlow will cost several million pounds; negotiations with the Mersey Docks and Harbour Board have reached an advanced stage but some problems in respect of the required way-leaves still have to be settled."

Equally important to the future were refinery operations, which would have to be tailored to demands. Western Europe now had sufficient refining capacity after big developments since the war; *e.g.* in the OEEC area from 20 million tons in 1948 to 110 million tons in 1956. In the United Kingdom the increase was even more spectacular; from 3 million tons in 1948 to 30 million tons at present.

Expansion was continuing and new equipment was being installed; *e.g.* the desulphurization technique had been introduced, and the first "platformer" at Stanlow.

The offtake from refineries was changing in pattern. Fifty years ago demand for gasoline was small; kerosine was the greatest need. Then followed a period of maximum demand for gasoline, and now requirements were tending to fuel oil for industry.

In the field of marketing a growth of sales was expected but a large and expensive investment was necessary to meet future demands.

Capital requirements for expansion programmes could only be met from the industry itself, *i.e.* from its net earnings or profits retained and invested in the business and from depreciation provisions. As an example of the vast sums involved he quoted expenditure of the Royal Dutch/Shell group; from £234 million in 1952 capital expenditure rose to £388 million in 1956, and the total for these five years was £1508 million!

In conclusion he referred briefly to the petrochemical industry, instancing its remarkable growth and range of products which included agricultural fertilizers, insecticides, glycerine, synthetic rubber, detergents, and plastics.

*ERA Work on Transformer and Switch Oils**

By **P. W. L. GOSSLING (Fellow)**†

This article serves as an introduction to the Symposium on Insulating Oils, organized by the IP, which is to be held at the Institution of Electrical Engineers, Savoy Place, London, W.C.2, on 5 March, starting at 2.30 p.m.

It is a long step in the technology of insulating oils since it was not uncommon for "solid" sludging of oil in a transformer to take place to a degree such that the unit when withdrawn from its tank had the appearance of a solid block. While the interim improvements in the selection of base stocks and in refining techniques have been matters for petroleum technologists, the Electrical Research Association, through its Section E, has been closely associated throughout with the work in this country upon the development of improved transformer and switch oils.

The history of the British developments in this field is substantially identical in its earlier days with the history of the Michie Sludge Test. In this country the first fully analytical discussion of the problem was by W. P. Digby and D. B. Mellis in 1910. Their communication to the Manchester Local Section of the Institution of Electrical Engineers[1], and the discussion which followed, made clear the conditions then existing in the supply of transformer oil. The chief complaints were low resistivity, stated to be due to alkalinity, and resinous impurities which were attributed to the use of wooden casks. Water present in the proportion of 0·1 per cent was regarded as too small to estimate accurately, and was referred to as a minute trace. Sludging in service was suggested to be due to the solubility of nominally oil-resistant varnishes, or possibly to polymerization of oil.

The apparatus recommended for measurement of electric strength by Digby and Mellis incorporated needle and plate electrodes, which were claimed to give the best reproducibility; incidentally, the truth of this is still recognized, provided that the aim is a test to fail oils rather than one to select those suitable for use. These points are further discussed later in this article.

Laboratory work upon the subject of sludging was financed by the Newcastle Electric Supply Company, and Dr A. C. Michie submitted his paper to the Institution in 1913[2].

It was now clear that transformer sludging was an oil oxidation problem, with metallic copper playing the part of catalyst in the reactions occurring.

Further early work in this country was sponsored by the Insulating Oils Sub-Committee of the IEE, formed in 1913, the activities of which were taken over by Section E of the ERA immediately upon its foundation in 1920.

The first meeting of the IEE Committee was held on 8 July 1913 with W. P. Digby, R. T. Glazebrook, F.R.S., F. E. Pollard, A. Schwartz, and W. Duddell, F.R.S., present, the last named being appointed chairman. At its third meeting, in February 1914, the Committee was joined by Dr Michie, who became the first chairman of the ERA Sub-Committee E/A, which has throughout dealt with chemical and physical tests, while Dr E. H. Rayner, of the National Physical Laboratory, became the first chairman of Sub-Committee E/B—Electrical Tests. Dr Michie remains still a member of the Sectional Committee, and Dr Rayner retired from chairmanship of Sub-Committee E/B as recently as 1954. Section E has carried out its work under the chairmanship of A. R. Everest and W. B. Parker, spanning the period to 1946, when Dr J. S. Forrest, the present chairman, was appointed.

Sludge and Acidity

It was a reasonable conclusion that the technical requirements for switch oil could be looked after by oils designed as transformer oils, and the early work of Section E led directly to the preparation of a joint specification for transformer and switch oils as British Specification No. 148, first issued in 1923 by the British Engineering Standards Association which later became the British Standards Institution. This standard incorporated the Michie Sludge Test and, with the establishment of the so-called non-sludging oil as Class A, serious and widespread sludging troubles became a thing of the past in this country. The Class A oil was recommended for use in transformers where operating temperatures were expected to be high, while Class B oil, of a higher permissible sludge value in the Michie test, was proposed for other use if desired. As a supplementary safeguard a limit upon the iodine value was favoured in some quarters, but this was abandoned as experience was gained.

The adaptation of the sludge test to deal with other phases of difficulty in transformer operation, such as the corrosion of tanks associated with the development of oil acidity under certain operating conditions, came about in the course of time; some of the work was outlined in 1946 in the paper

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* Reprinted from *Co-operative Electrical Research* (the Journal of the British Electrical and Allied Industries Research Association), No. 3, July 1957, p. 12.

† Wakefield-Dick Industrial Oils Ltd.

"The Contribution of the ERA to International Research on Transformer Oils", by A. C. Michie and the present writer[3].

The laboratory work just mentioned had been completed by 1939 and would doubtless have led to an early modification of BS148 in order to define a type of Class B oil less prone to acidity in service than was the case with commonly existing oils either of Class A or Class B. However, with the intervention of the war, it was not until 1951 that a new version of BS148 was issued and by then the Section had also investigated certain improvements in sludge testing technique which had led to a considerable improvement in precision.

In the intervening period, Class A oil had been abolished for reasons of national economy, and the Class B oil of "low acidity type" had virtually become established, although not specifically required by the British Standard. In addition, the results of specially designed service trials now confirmed that a correlation existed between the acidity developing in transformer oils in service and that formed in the Michie Sludge Test, even though the temperature of the latter, at 150°C, was considerably higher than in service, which had from time to time made this test a target for criticism.

As part of the ERA work, sludge tests had been carried out by the Michie method, but at a temperature of 100°C for a long period. These clearly showed that Class B oils, selected from their fellows in the Class B sludge group by reason of their lower acid development in the standard 150°C test, gave a comparatively insignificant sludge formation when tested at 100°C, being comparable at this temperature with Class A oil. The way was clear to the abandonment of the latter, a step which was taken in BS148: 1951, the one oil type then allowable being of low acid formation in the standard 150°C test, although with a sludge value comparable with that of the old Class B.

It is probably true to say that no further improvement of any significant degree can be expected in the quality of mineral transformer oils where oxidation stability is concerned; some further narrowing within the present type may, perhaps, be necessary if longer experience reveals specific deficiencies of some oils, but at the present time none such are under investigation in ERA. The improvement of oxidation stability by the introduction of oxidation inhibitors is a separate development which will be discussed later in this article.

Electric Strength

As well as those connected with sludge formation, the 1913 Committee of the Institution of Electrical Engineers had mentioned several other problems of transformer oil—the absorption of moisture and its relation to electric strength, the measurement of the electric strength, and the nature of the products of the arc under oil.

For the testing of breakdown value there were already in use arrangements of electrodes with spheres, points and disks, as discussed by Digby in 1915[4], but a preference for spheres soon emerged. E. B. Wedmore[5] stated in 1921 that, as a result of trials with half-inch diameter spheres, half-inch diameter disks, and needles, only the former could be relied upon to distinguish oils that had been dried and filtered from oils in their varying initial states of contamination. The problem had by then been passed to the newly formed ERA, upon whose advice the first edition of BS148: 1923 contained a test using half-inch diameter spheres with a separation of 0·15 inch, modified in 1927 to 13 mm diameter spheres with a 4 mm gap, which arrangement has remained standard until the present time.

Nevertheless, the testing of electric strength is not considered to have been satisfactorily resolved even at present.

The work through the years in this field does not readily lend itself to the writing of a consecutive story of development as in the case of the oxidation properties, because we are not dealing with a quality of the oil as such. In the course of a recent discussion of the subject organized by CIGRE (London, 1955), Professor Weiss aptly summarized the matter from the chair in the following words, "A test for dielectric strength can have no other object than to detect the presence of moisture and of suspended solid impurities."

The further researches of ERA since 1923 dealt with such subjects as the absorption of moisture by oil, the relationship between moisture content and breakdown value, and the effect of fibres and gases, but the testing method remained substantially unchanged. Some of the early work has been mentioned in an interesting paper by E. A. Evans, who was himself associated with the Committee work from 1921 onwards[6].

In recent years an increasing dissatisfaction with the test, because of its poor repeatability and, some say, lack of significance, has been accompanied by an acceptance of the fact that a dispersion of results is inevitable with oils in certain conditions, and that this can only be dealt with by a manner of expression of electric strength with a statistical basis.

One point which has caused some difficulty is the detection and interpretation of the so-called transient sparks which, in the BSI method, are not accepted as breakdowns. The ERA has been concerning itself since 1951 with the development of a method which accepts transient sparks as breakdowns and introduces statistical principles in deriving the reported value for electric strength.

Although already offered to BSI, the proposal has not found acceptance in the form first submitted. The writer feels that this has been largely because the test is required for different purposes by the various sections interested in BS148; *e.g.*, in connexion with the assessment of suitability of oil for initial filling of high voltage transformers during manufacture, and the "topping-up" of such units in the field, and with decisions upon the suitability of oil in service for continued use with or without reconditioning treatment. However, the ERA continues its work towards a solution.

Following discussions of electric strength at CIGRE, the subject has been taken up by IEC Technical Committee No. 10 with a view to international standardization of a test method. After the meeting at Munich in 1956 a programme has been suggested comparing results with plates, as at present the ASTM standard, spheres of approximately half-inch diameter, as used in Britain and several other countries, and the VDE electrodes, which are substantially shallow caps of two inch diameter spheres and have a considerable following in Europe. In this work the reduction of dispersion of results with the retention of selectivity is the aim, but the effect of duration of application and rate of rise of voltage is especially to be considered, work recently carried out in France being particularly informative in these regards.

It is to be noted that the conclusion by Wedmore, mentioned earlier, was based upon the work of A. R. Everest which was described in ERA Report Ref. E/T3 of 1920, and established the general relationship between results with plates, needles, needles and plates, and spheres, upon which the ERA preference for the latter was based, because of the greater selectivity obtainable.

Care and Maintenance of Oils in Service

A further branch of the work of Section E has been the preparation of recommendations for the care and maintenance of transformer and switch oils in service. A brief document on the subject, Ref. E/T54, prepared for wartime emergency use by D. V. Onslow was replaced in 1952 by Ref. E/S4, which was published with minor revisions two years later as Ref. E/S6 after distribution to members for comment following the trial use of the methods recommended. These papers were prepared by a panel of members of wide experience in this field.

With the low acidity type oils now in general use it had become possible, with no unrealistic implications so far as economic oil life was concerned, to recommend the replacement of oil at as low a value for acidity as 1·0 mgKOH/g, even though very large proportions of oil in service in the previous decade had been of several times greater acidity than this value. Sludge formation remained the manifestation of oil deterioration most to be feared, because of the destructive effects of the associated high temperatures upon the cellulose covering of windings and, although oil of higher acidity than 1·0 mgKOH/g would not necessarily cause directly associated troubles, *e.g.*, corrosion of tanks, experience had shown that serious sludging was rarely associated with acidity below that level.

The document upon oil maintenance included recommendations for a number of operative details from known good practice and has recently been taken as a basis, together with the recommendations upon the same subject already existing as Appendix A to BS171, the oil-filled transformer specification, for the preparation by BSI of a Code of Practice.

It is sometimes asked how it is that our recommended testing methods for oils in service do not include the measurement of interfacial tension for which claims are made in the United States that a pronounced reduction in value is indicative that sludge formation is imminent. The answer is that in British experience the reduction in I.F.T. occurs at an early stage of oil life, while acidity is still quite low and, with typical British oils, sludge formation normally quite remote. This difference in typical behaviour in the two countries is probably allied to the fact, as shown by data published in the United States upon the tests of oil in service, that sludge formation is commonly associated with acidity at a level very much lower than in Great Britain, an observation which has been brought to notice at CIGRE meetings by several British members. It is not to be concluded that the life of U.S. oils is inferior to that of British, but the difference in the type of oil commonly used results in a different inter-relationship of the acid and sludge forming properties. It is obviously unsafe to share experiences in transformer oil behaviour internationally so long as marked differences occur in the types in use.

International Standardization

The advantages of standardization of insulating oil internationally has been realized for many years but, so far, the major achievement of IEC in this field has been the production of a method of oxidation testing which, with standardization of apparatus and techniques, provides a means of international comparison of oil types. British laboratories, collaborating under the aegis of ERA, have taken a prominent part in this work.

Without a doubt the inspiration for the methods used in the post-war work of IEC Technical Committee 10 was provided by H. Liander of Sweden who gave before the CIGRE 1948 meeting a paper describing work in which oil soluble copper and iron compounds were used as oxidation catalysts in place of the conventional metallic copper. The importance of metallic iron as a catalyst had for many years been emphasized by Anderson, who had included its use in the Swedish standard test. Under the chairmanship of Professor H. Weiss of France, the IEC Committee has undertaken a series of programmes in which the effects of soluble and metallic catalysts have been compared. The ERA work has been carried out jointly in five laboratories of organizations in the oil and electrical industries and, while supporting the conclusions upon apparatus and techniques as described in IEC Publication No. 74, of 1954, entitled "Report on the Work of the Permanent Sub-Committee of Technical Committee No. 10: Insulating Oils", this work does not lead to the point where any recommendation can be made to BSI for a method considered more suitable for a purchasing specification than that of BS 148. Nevertheless, the work has been invaluable in leading to a better understanding of transformer oil oxidation problems, and of the differences in types of oils used in the countries collaborating in this work. Further, it has led already to a useful degree of standardization internationally, as several countries have decided to go over to testing methods based on the tentative IEC standard technique, at least on a trial basis. The aim of Professor Weiss to obtain "a common language" for this subject has to a large measure been achieved.

Inhibitors

For an advance in oil type many people now think in terms of the use of oxidation inhibitors. BS148:1951 legalizes their use provided that it is by agreement between vendor and purchaser.

"The Use of Anti-Oxidants for the Prevention of Sludge in Transformer Oils", Ref. E/T35, was published in 1927 following experimental work by the Association soon after the phenomenon of oxidation inhibition had been described by Moureu and Dufraisse. The writer feels it likely that the practical difficulty of the low oil solubility of those materials found most effective at that time, prevented their immediate further use. When more suitable anti-oxidants were found their value was demonstrated with turbine oils in the early nineteen-thirties and later in that decade with transformer oils on a trial basis by at least one organization.

Having regard to the established reliance of the industry upon a closely written specification, with its advantages in connexion with the compatibility of supplies of the product from various sources and with the guarantee of equipment filled therewith, it will perhaps readily be understood that acceptance of inhibited transformer oil has been retarded by the absence of a specification for such material. However, to write a specification requires the existence of an oxidation test agreed to be applicable to inhibited oil, and this position has not been reached.

To make progress upon the subject the ERA has, since 1952, had in hand field trials of two typical types of inhibited oil. The object of the trials is not only to gain experience of the behaviour of inhibited oils in service, and of the types of oil test most suitable for their "care and maintenance", but also to provide data for later correlation with the results of oxidation tests when the development of these becomes a matter for collaborative laboratory work. In the meantime, individual members of the Sectional Committee are investigating laboratory test methods for inhibited oils, and more

fundamental studies are being made of the oxidation processes involved, to which further reference is later made.

Allied Work of other Sections

In addition to work upon insulating oils carried out under the guidance of Section E, two contributions from Section G—Switch and Control Gear—are notable, the work in both cases having been carried out in the ERA laboratories.

C. E. R. Bruce and W. B. Whitney[7] investigated the nature of the gases liberated during arcing. This work was originally reported in 1933 and, although mainly concerned with the provision of data for calculation of pressure rise in the design of switchgear, has tended to confirm that no special selection of switch oil on the basis of its chemical constitution would be helpful in these regards.

A. Kobler[8] has fairly recently examined the carbonization of switch oil during arcing, including a study of deposition of carbon upon insulation, and some work upon the effects of certain oil additives.

Useful studies have been made by M. R. Dickson of the general problem of the "Generation of Gases in Transformers"[9] and "The Causes and Effects of Water in Oil-Immersed Transformers"[10].

Extra-Mural Researches

The greater part of the work of Section E has been carried out in the laboratories of collaborating members, but important contributions have been made by universities, with financial support by ERA. A study of the general problems facing the original IEE Committee was made for several years at the Manchester School of Technology, and in the 1920s investigations upon resistivity and electric strength of oils were made at University College, London, under the direction of Professor J. A. Fleming. In the course of the last-mentioned work the relationship between the electric strength of oil with electrodes on horizontal and on vertical axes was examined; the latter was found to give higher values and was rejected as being less sensitive to the presence of impurities.

A series of ERA sponsored researches have recently been in progress at Birmingham University under the direction of Dr J. B. Higham. The effect of pressure, up to 25 atmospheres, upon the electric strength of various liquids under stresses of millisecond and microsecond duration has been studied, and the work is yielding important information upon the mechanism of breakdown in fluids, especially upon the part possibly played by dissolved gases.

Mention has been made earlier of the usefulness of recent work in collaboration with IEC upon the development of an oxidation test in which soluble copper and iron catalysts are used as an alternative to metallic copper catalyst. In the course of ERA Committee discussions upon this subject it was agreed that any further progress in the improvement of oils with regard to oxidation in service, and in the development of laboratory testing methods for the assessment of this property would be very much assisted by the availability of more fundamental knowledge of the mechanism of low temperature oxidation of mineral oils. This applied particularly in the case of oxidation inhibited oils. It was felt that research work to this end would be of a type prosecuted to best effect in the chemical departments of universities where the approach would be fundamental, and where it would be hoped that new techniques, possibly already having been found useful in other directions, would be brought to bear upon the problems.

It was considered useful as a first step for a detailed survey to be made of the whole of the published literature upon the subject. This work was entrusted to Professor F. Morton, then of Birmingham University, who also undertook to prepare a critical résumé, with suggestions as to the most useful direction for further work.

Professor Morton's report became available in 1955 (Ref. E/T65) and, with the benefit of his further advice, Section E concluded that investigations which could usefully be sponsored by ERA fell into three divisions, each being somewhat allied in type, or at least in probably advantageous techniques to work already being prosecuted separately in three university schools.

Programmes were accordingly agreed for work to be carried out at the University of Birmingham under the direction of Professors H. W. Melville, F.R.S., and F. Morton, of the Departments of Chemistry and of Chemical Engineering respectively, and in the Department of Inorganic and Physical Chemistry of the University of Liverpool under the direction of Professor C. E. H. Bawn, F.R.S. Professor Melville having recently left Birmingham the work there will now be continued by Professor J. C. Robb, and it has been arranged to transfer the work under the guidance of Professor F. Morton to the University of Manchester, where a new Department of Chemical Engineering is being established under his direction.

A new panel of Sub-Committee E/A, which has been formed to guide these investigations, includes those already mentioned as directors of the work at each university, and a group from the electrical and oil industries. In their discussions of oxidation reactions the evident shortage of knowledge upon certain features of metallic copper behaviour in existing transformer oil oxidation tests has already prompted new work among members of the industrial group, supplementary to the more fundamental approach in the university laboratories.

Collaboration

Mention has not yet been made in this article of collaboration with the Institute of Petroleum, but liaison is active, especially by means of the duplication of representation by a number of members of Section E Committee and BSI Committee ELE/20, to which IP representatives are directly attached. The clear separation of the functional activities of the three organizations concerned is important.

Reviewing the whole of the activities of Section E through the years, there appears to have been in action a degree of liaison between the two industries, electrical and petroleum, which has been able to deal satisfactorily with the problems arising, and has for a long time provided an example of successful collaboration which is perhaps rather hard to find in other pairs of industries. The standard of the secretarial organization of ERA has undoubtedly been an important factor.

As was quite evident from the discussion following the meeting of the Institute of Petroleum in June 1955, at which the activities in the United States of the Co-ordinating Research Council were described, there exists considerable doubt upon the preferred form to be taken in Great Britain in the organization of co-operative research between two industries. Particularly was there a strong feeling upon the importance of the arrangements being such as not to interfere with competitive research on the part of commercial bodies. A study of the ERA technique in dealing with the problems arising might assist other industries in this country when planning the organization of jointly sponsored research.

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HD OILS

The following additional oils have been approved by the Director of Chemical Inspection, Ministry of Supply, as complying with the requirements of Defence Specification DEF-2101-A.

Supplier and supplier's nomenclature	*OMD grade of oil*
AB Nynäs—Petroleum	
Nynäs 21 DG 10W/20	40
B.P. Trading Ltd	
BP 2107	40
BP 2108	40
BP 2203	60
BP 2328	110
Compagnie Française de Raffinage	
Total HDO	110
Dalton & Co. Ltd	
Hartington 30	110
Emil Finke Mineralöle	
Aviaticon Unique SAE 10W/30 HD Supplement 1	110
Gulf Oil (Great Britain) Ltd	
Gulflube Motor Oil XHD 30 (G.B.)	110
James Light & Son Ltd	
Liadgo LHD 10W	40
Liadgo 30 LHD	110
Liadgo 50 LHD	330
Liadgo S—1 HD	110
Mobil Oil Co. Ltd	
——	110
National Benzole Co. Ltd	
NBC Mil HD 10W	40
NBC Mil HD 30	110
NBC Mil HD 50	330
Georg Oest & Cie	
Ostol Gigant Motor Oil HD 20	60
Ostol Gigant Motor Oil HD 30	110
Rimer Brothers Ltd	
Rimer's 10W HD Motor Oil	40
Rimer's 30 HD No. 1 Motor Oil	110
Shell-Mex and B.P. Ltd	
Shell Oil S. 5240	110
Société des Petroles Shell-Berre	
Shell Oil S. 5068	40
Shell Oil S. 5069	60
Shell Oil S. 5071	330
Veedol GMBH	
Hamigol HD-M SAE 10W	40
Hamigol HD-M SAE 20/20W	60
Hamigol HD-M SAE 30	110
Hamigol HD-M SAE 50	330
C. C. Wakefield & Co. Ltd	
Wakefield H 52/57	40

U.K. CONSUMPTION OF PETROLEUM PRODUCTS

Deliveries (excluding bunkers) of petroleum products for inland consumption in the United Kingdom during the period January to September 1957 (which included 4½ months of fuel restrictions and rationing) were 1,033,673 tons less than those in the corresponding period of 1956, according to figures published by the U.K. Petroleum Industry Advisory Committee.

The decrease is largely attributable to reductions of 591,789 tons in motor spirit (including motor benzole), and of 137,196 tons (excluding refinery consumption) of gas, diesel, and fuel oils. There were also reductions in deliveries of aviation fuels and kerosine.

Full details are given in the following table:—

U.K. DELIVERIES INTO INLAND CONSUMPTION OF PETROLEUM PRODUCTS (IN TONS)*

Product	*January to September*	
	1956	1957
Aviation fuels	1,344,503	1,240,028
Motor spirit (including motor benzole):		
Premier grades	2,525,091	2,270,282
Standard grades	2,319,764	1,982,784
	4,844,855	4,253,066
Industrial spirits (incl. industrial benzole)	107,783	128,347
White spirit	115,741	113,508
Kerosine:		
Burning oil	553,137	477,886
Vaporizing oil	437,465	418,827
	990,602	896,713
Derv fuel	1,321,795	1,308,715
Gas, diesel, and fuel oils		
Gas/diesel oil	1,720,657	1,595,568
Fuel oil	4,648,658	4,636,551
Refinery consumption	1,641,045	1,567,278
	8,010,360	7,799,397
Lubricating oils and greases	649,491	612,645
Paraffin wax and scale	37,162	35,871
Propane and butane	51,363	53,862
Bitumen	715,064	652,540
Other products	516,434	576,788
	18,705,153	17,671,480

* Deliveries for bunkers for ships engaged in the foreign trade are not included.

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MIDDLE EAST PRODUCTION

	November	*Jan.–Nov.*
	Tons	
Iraq Petroleum Co. Ltd	1,343,627	10,203,713
Basrah Petroleum Co. Ltd	966,319	8,114,484
Mosul Petroleum Co. Ltd	69,966	482,590
Qatar Petroleum Co. Ltd	548,984	5,838,635
Iraanse Aardolie Exploratie en Productie Mij	2,818,000	31,772,000
Kuwait Oil Co. Ltd	4,488,020	51,029,921

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for November was 1,126,000 tons, the total for 1 January to 30 November being 14,086,000 tons.

Notes of the Month

Castrol Shares Marine Adventure

Early December saw the departure from London of an adventurous team of ten men on a 13,000 mile journey to New Zealand. They sailed in the motor fishing vessel *Solent Swan* which is owned by Major William Ellery-Anderson, leader of the enterprise. Major Anderson has as his partner Graham Gain, an Australian who has spent most of his life at sea and who in 1956, sailed the m.f.v. *Pagan* over the same route.

Powered by a 21-year old 80 h.p. MV4 National diesel engine lubricated with Castrol XL, *Solent Swan* has an overall length of 48 ft, a beam of 15 ft, and is the smallest boat ever to attempt such a long voyage on power alone.

The trip is expected to take four months and there will be calls at Madeira, Kingston (Jamaica), Port of Spain (Trinidad), Georgetown (British Guiana), Panama, and Tahiti before reaching Auckland.

The Major intends to sell his well-equipped boat on arrival in New Zealand and to return to England by air.

OEEC Sets Up the European Nuclear Energy Agency

The Council of OEEC has adopted the statute of the European Nuclear Agency and has signed the international agreement setting up a first joint undertaking, the European Company for Chemical Processing of Irradiated Fuel (EUROCHEMIC).

The European Nuclear Energy Agency is a specialized agency established as from 1 February 1958 within the framework of the OEEC, and under the authority of its Council. Its object is further the development of the production and uses of nuclear energy for peaceful purposes through technical co-operation among the countries of Western Europe.

Catalytic Reformer for Kwinana Refinery

Work has started at BP's Kwinana refinery in Western Australia on erection of a catalytic reformer to produce a high-grade motor spirit component.

The reformer, which will be capable of a throughput of 10,000 b.d., will cost about £A4,000,000.

Some of the equipment has been supplied by the United Kingdom, but as much as possible of the material is being purchased in Australia. Erection will be supervised by British and American engineers, but a labour force of about 300 will be recruited in Western Australia.

The reformer will be ready for commissioning by the end of this year.

Several large storage tanks for both crude oil and refined products are being erected at Kwinana. Steel for these was purchased in Australia and erection is being carried out by Western Australian contractors.

Surrender of 36,650 Square Miles of Sarawak Oil Concessions

36,650 square miles of oil mining leases, mainly in the interior of Sarawak, were surrendered at the end of 1957, as intensive pre-war and post-war surveys had produced no evidence of oil deposits.

Sarawak Oilfields Ltd, a member of the Royal Dutch/Shell Group of companies, has spent nearly £9 million on exploration in Sarawak since the end of the war. A total of 17 deep exploratory wells have been drilled, some in remote localities, but all were dry except those at Suai near the coast where insignificant quantities of oil and gas were found. Although 77 per cent of the leased area over land and territorial waters was surrendered, the obligation under the lease only required 11,875 square miles to be surrendered by 1958 and similar amounts by 1963 and 1968, making in all a total of 75 per cent. The Company is retaining under the concession 10,850 square miles, mainly in the coastal region, where the search for oil will continue.

Following upon technological advances of recent years, the search is also being directed towards extensive unexplored areas beneath the sea. Between 1954 and 1956 the Company participated in a co-ordinated survey of the offshore areas of Sarawak, Brunei, and North Borneo. The results of this marine exploration have been sufficiently promising to warrant drilling at several locations in Sarawak waters. The first two wells have been drilled by Sarawak Oilfields Limited from a marine platform at Siwa, some 8 miles offshore, and Brunei Shell has drilled one well from a similar platform at Ampa Patches, about 25 miles offshore. Although these wells were dry, the intention is to continue with further exploratory drilling at sea and a mobile platform is to be hired for this purpose.

Continuous Process for Acetylene and Ethylene Production

A process for the continuous production of acetylene and ethylene from naphtha or natural gas feedstocks is now offered by The M. W. Kellogg Company, New York, a subsidiary of Pullman Incorporated. The process was originally developed by Société Belge de l'Azote (SBA), Liège.

Using naphtha as feedstock, a wide range of ethylene to acetylene ratios may be produced and the flexibility of the process makes possible simultaneous production of ethylene and acetylene. When natural gas is used as feed, acetylene is the primary product and negligible quantities of heavy impurities are encountered. The SBA-Kellogg process can be designed to operate on either feedstock.

The heart of this process is the SBA-developed burner. It is easy to control, requires minimum attention, is stable, and operates continuously to produce a constant yield. Any traces of carbon and residual heavy hydrocarbons are automatically removed by special equipment.

In the process train, the heavy acetylenes and hydrocarbons are separated first, leaving a stream containing acetylene and lighter materials. By using an SBA-developed ammonia-absorption system, acetylene is removed from lighter materials comprised essentially of ethylene, hydrogen, and carbon monoxide. The acetylene, 99·5 per cent pure or higher, is then stripped from the ammonia.

Esso Lays Experimental Road in Sweden

Nearly a mile of the Bergslagsvägen, an important highway leading westwards out of Stockholm, has recently been resurfaced with some sixty experimental asphalt sections. Designed to prove the road serviceability of bitumens for future Esso production, the experiment was initiated by scientists of Esso Research in co-operation with the Swedish State Road Institute and the City of Stockholm Road Department, who were responsible for the actual road-laying work.

Speaking in Stockholm, H. L. West, departmental manager of Esso Research Ltd, said: "These road trials will provide valuable information about the quality of asphalt needed on modern roads. Such information will enable petroleum refiners to make better use of the crude oil from which road asphalts are made."

For the trials seven bitumens were formulated in different ways from crude oils from the Middle East and the Western Hemisphere. They were mixed in carefully controlled proportions with Swedish granite in the City of Stockholm's up-to-date road-making plant, one of the largest in Europe. The amounts of materials used, the different sizes of stone, and the proportion of bitumen incorporated were devised with the experience of the Swedish State Road Institute.

With the skyscraper houses of the new town of Vällingby looking on, the roller completes the laying of another section of Esso asphalt trials near Stockholm

The experimental asphalt mixtures were laid in 20-metre sections along the dual-carriageway of the Bergslagsvägen near Vällingby, each section taking up half the width of the carriageway. To ensure realistic results from the trials, normal laying procedures were used and a number of standard asphalt mixtures were laid alongside the experimental sections.

An Esso scientist, commenting on the work, said that complete results would not be obtained for several years. He added: "Together with a similar length of experimental road laid nearly four years ago in the milder and wetter climate of England, these Swedish trials constitute one of the most extensive road-making experiments ever conducted by a petroleum research organization."

Drilling to Start in Senegal

Following geophysical surveys in South Senegal, drilling of a deep test well is expected to begin in the Casamance area early this year.

The well will be drilled by the Société des Pétroles du Senegal, which was formed in 1956 to carry out oil exploration in this part of French West Africa. BP Exploration Company has a 30 per cent holding in the company and BP's French associate, Société Française des Pétroles BP, a 20 per cent holding. The remaining 50 per cent participation is in French hands.

A drilling rig capable of reaching a depth of 12,000 ft recently arrived at Dakar. The rig and other equipment is being carried by small ships to the Casamance area, about 150 miles south of Dakar, where a BP drilling team is to be assembled shortly.

The British Group for Computation and Automatic Control

The rapid growth of automation, which comprises computation, process control, and data processing generally, led to a decision in April 1957 by some twenty bodies of the learned society type to set up a central organization to provide more effective liaison between the interested bodies, to be known as the British Conference on Automation and Computation.

The Conference has been organized into three groups, as follows:—

A. The British Group for the Engineering Applications of Automation.

B. The British Group for Computation and Automatic Control.

C. The British Group for the Sociological and Economic Aspects of Automation Techniques.

Group B has now been formally constituted, and among the 23 societies who are members are the Institute of Fuel, The Institute of Petroleum, and the Royal Aeronautical Society.

The objects of this group are to foster the development and applications of automatic controls, to afford a common meeting ground for the organizations concerned, to maintain liaison with the other groups of the Conference, to encourage presentation of papers at International conferences, and through the general committee of the British Conference, to maintain liaison with other National Committees.

T. E. Goldup, C.B.E., president of the Institution of Electrical Engineers, was elected chairman of the Group, with J. F. Coales, O.B.E., M.A., (Society of Instrument Technology), and E. M. Renals (Institute of Cost and Works Accountants) as vice-chairmen.

J. D. Green (Institute of Chartered Accountants in England and Wales) was elected honorary treasurer, and W. Bamford (Institution of Electrical Engineers) honorary secretary.

Synthetic Rubber to be Manufactured at Pernis

A synthetic rubber plant with an initial capacity of at least 50,000 tons p.a. is to be constructed at Pernis, near Rotterdam, Holland, for Shell Pernis Chemische Fabrieken N.V.

The decision to erect this plant has been based on extensive studies of the world future rubber requirements and supply

position. Supplies of natural rubber already fall considerably short of total world rubber requirements and it is not expected that the increased total demand can be met from this source.

Shell Pernis Chemische Fabrieken N.V. has developed into a major chemical production centre since the war. The site of the new plant has been chosen for its advantages in respect of accessibility to shipping and the supply of raw materials.

New Esso Tanker Launched

A new 36,040-dw ton Esso tanker was launched in December from the Naval Yard, Walker, Newcastle-upon-Tyne.

The vessel was named *Esso Durham* by Mrs Wackrill, wife of W. F. Wackrill, a director of Esso Petroleum Company Ltd, and is the first of four ships on order from Vickers Armstrong Ltd, two of which are 36,040 dw tons and other two are 47,000 dw tons. Options are held to increase the latter to 65,000 dw tons.

Esso Durham will transport crude oil from Middle Eastern ports to the Esso Refinery at Fawley, near Southampton. The vessel is 690 ft overall in length with a beam of 90 ft and will have a loaded summer draught of 35½ ft. She will have a service speed of 17 knots and will be capable of discharging her cargo in less than nine hours at a rate of 4350 tons per hour through four pumps.

British Firms Share in New Project of Iranian Oil Consortium

Two British firms, Richard Costain Ltd and Constructors John Brown Ltd, are part of an international group awarded a contract by the Iranian Oil Exploration and Producing Company. Other members of the group are Werkspoor and Bredero of the Netherlands and Raymond Concrete Pile Company and Williams Brothers of the United States.

Colonel P. McA. Sinclair, director of Richard Costain, spokesman for the group, has stated: "The group is to develop facilities for a new terminal in the Persian Gulf at Kharg Island which will make it possible to increase production from the oilfield at Gach Saran. The project includes a 26/28-inch pipeline from the oilfield to the sea; a 30-inch underwater sealine to be laid to a depth of approximately 150 ft; tankage and storage facilities; workshops; housing and amenities; a loading jetty and boat harbour. Construction contracts will normally be undertaken by the member firms of the group individually but in special circumstances may be allocated outside the group."

The total cost of the project is estimated at £20 m.

New Shell-Mex and B.P. Installation at Newport

The Mayor of Newport, Councillor F. G. Hopton, recently opened a new installation for Shell-Mex and B.P. Ltd in Newport.

Occupying a triangular site of 7 acres adjoining Alexandra Dock and leased from the British Transport Commission, the installation replaces four depots at Newport, Cardiff, Pontllanfraith, and Abergavenny. From it more than 40 road tankers will serve an area extending from Glamorgan in the west to the Forest of Dean in the east, and northwards across the Black Mountains into Herefordshire.

The new installation has fifteen vertical tanks ranging from 20 to 40 ft in diameter and also nine smaller horizontal tanks for storage of all grades of Shell and BP motor spirit, jet fuel, and kerosine, gas oil and derv fuel, and light and heavy fuel oil. The loading equipment is of the most modern type.

Main supplies are delivered by coastal tanker from the Shell and BP refineries to a small dock linked with the depot by pipeline.

Newport has been made the headquarters of the East Wales Branch of Shell-Mex and B.P. Ltd and office accommodation is provided in a single-storey administrative block which also houses the installation staff.

BP's Experimental Hydrant Fuelling System

In order to study problems of hydrant fuelling of aircraft, with particular reference to the future fuelling of super jets, the British Petroleum Company, in co-operation with Flight Refuelling Ltd, has undertaken a comprehensive test programme on hydrant work, with special attention to surge effects.

Checking discharge pressure and rate of flow

A complete hydrant fuelling system was built from a storage tank through 1000 ft of pipeline and fuel-dispensing units to an aircraft fuelling system and finally through aircraft tank valves into actual aircraft tank structures.

In this way it has been possible to simulate actual conditions arising during aircraft fuelling and to observe the effects under ideal conditions.

The plant was fully instrumented with an oscilloscope pressure-recording apparatus, and permanent records of surge effects under different operating conditions have been obtained by the use of camera attachments.

New Oil-Search Vessel Reaches Nigeria

Designed to help in drilling for oil in the tidal mangrove swamps of the delta of the River Niger, an all-steel floating tender has reached Port Harcourt, Southern Nigeria, after being towed for over 4000 miles by sea from Europe. The journey from the Netherlands, where the structure was built for the Shell-BP Petroleum Development Company of Nigeria, took six weeks.

The tender, which includes a helicopter landing platform, will be the first to be used in a new phase of the expanding

Nigerian oil search activities. A total capital outlay of £1,300,000 covers the cost of the tender's construction and of supplying its ancillary equipment.

The vessel has a draught of 8 ft, is 158 ft long, and 80 ft wide. Apart from the drilling unit, which is fixed on a platform placed on piles and driven into the sea bed, the tender houses all the machinery, plant, fuel, and stores necessary for this type of operation. It can support non-stop drilling operations for up to 30 days.

The delta tidal swamps, where to date no test wells have been drilled, form part of Shell-BP's prospecting area which altogether covers some 40,000 square miles.

Hydrofining of Benzole

In the September 1957 edition of the IP *Review* there appeared a short account of a plant for refining crude benzole, and other hydrocarbon oils that was being erected at the Thorncliffe works of Newton, Chambers & Co. Ltd.

The pilot plant for hydrofining of benzole at Newton Chambers & Co's Thorncliffe works

The catalytic hydrogenation process being used was the result of work over several years by the Coal Tar Research Association from whom Newton Chambers have secured the world rights of manufacturing plants to operate the process.

The plant is now in operation and has a capacity of 500 gallons of crude benzole daily. It is successfully desulphurizing coke-oven benzole of British origin having total sulphur contents greater than 2 per cent.

Although other plants for similar purposes exist overseas, notably in Germany and the United States, the Thorncliffe plant is the first British effort to tackle problems peculiar to the British benzole industry.

An important aspect of the development is that it makes possible an increase in the quantity and quality of the home-produced contribution to Britain's motor-fuel supplies.

New BP Tankers

Two vessels of the super-tanker class were launched for BP on succeeding days in the first half of December. BP Tanker Company's second 34,500-dw ton tanker went down the slipway at the Govan, Glasgow, yard of Fairfield Shipbuilding and Engineering Company Limited on 11 December and was named *British Energy* by Lady Mills, wife of Lord Mills, Minister of Power.

On the previous day the sixth 32,000-dw ton tanker to be launched in 1957 for BP Tanker Company was named *British Faith* by Mrs Eadie, wife of W. E. Eadie, a BP director. The vessel was launched from the Barrow-in-Furness yard of Vickers-Armstrongs Limited.

The third 34,500-dw ton tanker for the BP Tanker Co was launched towards the end of December from the Wallsend-on-Tyne yard of Swan Hunter and Wigham Richardson Ltd. The vessel was named *British Aviator* by Mrs Dummett, wife of R. B. Dummett, a managing director of BP.

The vessel is the second *British Aviator* to sail under the BP flag. The original tanker of that name, which was of 10,762 dw tons, was built in 1924 and was the first motor ship to join the Company's fleet.

Performance of Oil-from-Coal Units in South Africa

All process units at Sasol, the first large-scale commercial oil-from-coal plant, have proved their design capacity or better, recently stated W. B. Johnson of The M. W. Kellogg Co., New York, in an address to the New York section of the American Institute of Chemical Engineers.

The South African plant was now running at stream efficiencies of from 70 to 75 per cent, and improving operating efficiency through the correction of mechanical difficulties was now the only major task preventing the plant from meeting the design capacities of about 55 million gallons per year.

Mr Johnson, manager of the Sasol project since 1951, when Kellogg was awarded the overall contract to design and build the plant, reported that at Sasol one ton of coal at 60 cents per ton produced one barrel of product worth approximately $12 a barrel. Raw synthesis gas including write-off and all other costs was produced at about 7 cents/1000 s.c.f. and purified gas at about 12 cents/1000 s.c.f.

Metal Science Brainpower Pool

The American Society for Metals has formed a "Free World Metal Science Brainpower Pool" and has invited the U.S. Government to call upon it in aiding the stepped-up scientific programme confronting America.

William H. Eisenman, national secretary of the 29,000-member world-wide Metals Engineering Society, whose headquarters are in Chicago, said that the Pool would be able to speed helpful exchange of important metals information around the world, but its scope would be limited to non-restricted aspects of metal science though its resources would be available on all phases. Membership would be comprised of some 20 world scientific metal societies, each of whom would appoint a committee of correspondents to relay pertinent information to the American Society for Metals which would act as a collection and redistribution agent.

Among the nations represented are Belgium, France, Germany, India, Italy, Japan, Luxemburg, Switzerland, the United Kingdom, and the United States.

New Phenol Plant for British Hydrocarbon Chemicals at Grangemouth

Synthetic phenol is to be made on a large scale at Grangemouth, Stirlingshire, by British Hydrocarbon Chemicals Ltd, which is owned jointly by The British Petroleum Co. Ltd and The Distillers Co. Ltd.

The plant, which is to be completed by the middle of 1959, will use a new process developed in Great Britain by The Distillers Company. Cumene will be made at Grangemouth from benzene and propylene (a product of the existing "cracking" units). In the subsequent conversion of cumene to phenol a large tonnage of acetone, an important industrial solvent and chemical intermediate, will also be obtained.

Good progress is being made with the British Hydrocarbon Chemicals' project, to make high-density polyethylene. Construction work is now proceeding at Grangemouth, and it is expected that the plant will be commissioned early in 1959.

The cost of these two projects will be more than £8,000,000. This will bring the investment of British Hydrocarbon Chemicals Ltd to over £25,000,000.

Jersey Standard Plans $1,250,000,000 Expenditure Programme for 1958

1957 has been a difficult year for the oil industry and 1958 will continue to present problems of excess supply and some price weakness, but Standard Oil Company (New Jersey) views the longer range outlook with complete confidence, Eugene Holman, chairman, said in his year-end statement on 30 December.

"The expenditures the company and its affiliates have made in recent years for capital investment and in the search for oil and gas put us in good shape to meet these increased demands for petroleum."

Jersey Standard and the operating affiliates included in its consolidated report have programmed capital expenditures in 1958 for producing, refining, marketing, tankers, pipelines, and equipment and for other expenditures in the search for oil and gas at approximately $1,250,000,000, the same amount estimated at the end of 1956 for 1957. Actual expenditures for 1957 are expected to total $1,400,000,000. This would be the largest programme in the company's 75-year history.

In addition, Jersey Standard's share of such expenditures by non-consolidated companies, in which the company holds 50 per cent ownership or less, is estimated at $130 million in 1958, compared with an estimate of $120 million for such companies in 1957.

Although about 75 per cent of the 1958 programme is for the Western Hemisphere, where Jersey does the major share of its business, more investment has been programmed in Europe than was the case in 1957, primarily for additional refining capacity and other facilities for marketing oil products.

Subdivided functionally, Jersey Standard's capital programme for 1958 calls for 48 per cent to be expended for producing facilities, exploration and other expenditures in the search for oil and gas; 27 per cent for refining; 13 per cent for marketing facilities; 12 per cent for marine and pipeline transportation.

Mr Holman said that 1957's programme will bring to more than $8·5 million the total spent by Jersey Standard and its operating affiliates since world war II to help meet the growing need for energy and oil products in the free world.

He estimated industry demand for oil products in 1957 was up one per cent in the United States. In free foreign areas, oil demand increased by an estimated six per cent over the previous year.

"In 1958 we look for new high levels of demand for petroleum products world-wide, but again expect that rates of increase will be lower than the post-war average, probably around 1½ per cent in the United States, and averaging 8 per cent for foreign countries."

During a year in which science and technology assumed a greater significance than ever before, Jersey's scientific affiliate, Esso Research and Engineering Company, took a number of forward steps.

"To increase the scope of exploratory research being done at the Radiation Laboratory in Linden, N.J., the company acquired the most powerful radioactive source ever supplied to private industry by the Atomic Energy Commission plant in Oak Ridge, Tennessee.

"In gearing itself for future expansion, the company launched a programme to build an engineering and research centre on a 675-acre site in Florham Park, N.J. This location will supplement the existing major centre in Linden," Mr Holman said.

The Trevelyan Scholarships

A new kind of scholarship, sponsored by industrial concerns and representatives of Oxford and Cambridge Universities, is to be known as the Trevelyan Scholarships.

These scholarships will enable boys of British nationality who are receiving full-time education at schools in the United Kingdom to attend Oxford or Cambridge. Their value will be £450 p.a. for three years, and it is expected that 12 to 14 scholarships will be offered annually at each university during the initial five-year period of the scheme.

It is intended to make the first selections in November 1958 by a committee consisting of representatives of the two universities and industry in equal numbers, under a permanent chairman. Address of the Committee is 17 Westbourne Road, Sheffield 10.

Drilling Barge Arrives in Persian Gulf

Adma Enterprise, the first drilling barge of its type to be used in the Middle East, has arrived at its base at Das Island in the Persian Gulf after a 6800-mile tow from Germany. Drilling of the first underwater deep-test well to be undertaken by Abu Dhabi Marine Areas Ltd began last month.

BP to Market in the Congo

A new company, Société des Pétroles BP du Congo, has been registered in Belgium and incorporated in the Belgian Congo. It will undertake, for the first time, marketing of BP products in the Belgian Congo.

Operating headquarters are at Usumbura, capital of the Urundi area of the Congo, but the administrative office is in Antwerp.

Development of Butyl Synthetic Rubber

For over twenty years the Esso Research & Engineering Company has actively participated in synthetic rubber research and development. For many years before that Esso Research management was interested in rubber problems, such as how rubber behaves, why it acts as it does, and how similar materials might be tailor-made to produce even better characteristics.

In a recent talk Dr William J. Sparks, Scientific Adviser of Esso Research and Engineering Company, New York, and co-inventor of butyl rubber, reviewed the development of butyl rubber.

He recalled that all-butyl car tyres are already being successfully produced on a small scale in America and that the United States army recently announced the development of an all-butyl heavy-duty truck tyre.

He forecast the development of "a wide spectrum of new synthetic rubbers," which would have chemical make-ups similar to butyl. They would make possible a broad selection of rubbers for construction of composite tyres better than those made of only one rubber.

Future tyres might be a composite of several new synthetic rubbers leading to revolutionary concepts of tyre manufacturing. These synthetic rubbers might be tailor-made for each vital part of a tyre such as the treads, sidewalls, beads, and plies.

A multi-synthetic tyre would give greater overall performance. Resistance to abrasion, heat, and chemical attack would be strengthened and serviceability and safety features would be improved.

At present mass-produced vehicle tyres were made of a combination of GR-S (general purpose) synthetic and natural rubber. Each had common strong and weak points, and various additives and modifiers had to be used to counteract the disadvantages.

Butyl synthetic rubber's departure from the classical concept of synthetic structure pointed the direction for the development of new compatible synthetics for new jobs.

The rubbers of the future would lend themselves to the vital vulcanization step through agents other than sulphur, which was at present commonly used for bringing about vulcanization.

Esso Research scientists have also unmasked the role of carbon black in rubber. Carbon black has been universally used to add strength, but it damages the elastic properties of rubber unless properly and widely dispersed.

Development of butyl over the years has made possible fundamental investigation into the chemistry of rubber. Natural rubber and GR-S synthetic rubber have countless places in their chemical structure where over-vulcanization and other side reactions can occur. Because of this chemical complexity, it had never before been possible to determine exactly how much sulphur was needed to produce the best possible rubber. Butyl, however, has a relatively simple molecular set-up and chemists have been able to analyse it accurately and to learn the answer to such puzzles and much about the behaviour of any rubber-like material.

BP Testing the Turbo-Drill

The first turbo-drill to be used in England is being tested by the BP Exploration Company at their Egmanton oilfield in Nottinghamshire. The drill, of French manufacture, is being used to drill production wells to a depth of about 3000 ft.

The turbo-drill is a 30 ft cylinder which is attached at the end of the ordinary drilling pipe. Mud pumped at pressure down the drilling pipe turns blades within the cylinder which provide power to rotate the drilling bit. It is claimed that as the pipe does not rotate as in conventional drilling, no power is lost and drilling progress is faster, although the same bits are used in both methods.

New Rocket Fuel

A new rocket fuel which will lock the most efficient practical chemical propellant, a boron-carbon-hydrogen compound in solid form, is being developed by Callery Chemical Co., a pioneer in the field of liquid high-energy fuels.

Dr W. H. Schechter, vice-president operations, recently stated, "The significance of this is that it will combine the most efficient type chemical fuel, HiCal, with the most efficient rocket design, since a rocket with solid propellant requires no fuel-transfer mechanism."

The new fuel would be known at present as "solid HiCal".

The Company, which is owned jointly by Mine Safety Appliances Co. and Gulf Oil Corporation, may also conduct research in the fields of oxidizers and other propellant components.

New Oil Wells in Cuba

P. H. Bergson, vice-president of Consolidated Cuban Petroleum Corporation, has announced that two new wells have encountered production in the Bacuranao-Cruz Verde field east of Havana. They are Cruz Verde No. 7 which struck production at 1335 ft and Consolidated Cuban No. 6 which reached oil at 1235 ft.

The two wells are being completed but Cruz Verde No. 7 caused difficulty because of strong gas pressure forcing sand up the casing.

So far, through bailing alone, Cruz Verde No. 7 has been averaging about 15 b.d., and Consolidated Cuban No. 6 about 25 b.d.

It is planned to clean out Consolidated Cuban No. 4 which has become plugged by cave-ins. Four new locations are being cleared and the Company will continue its drilling programme in this field. One of the new locations is in the segment of lot D–N recently purchased, two are in lot D–S, and a third is in lot C.

Consolidated Cuban-Ensign No. 1, a wildcat being drilled several kilometres to the south of the Cruz Verde field, is drilling below 900 ft in a shale formation. It is planned to lower $10\frac{3}{4}$-inch casing to 1000 ft, and then drill ahead to at least 3000 ft.

A cable tool rig has been placed over Consolidated's proposed deep test in the centre of the Motembo field, Las Villas, and drilling will take place on Consolidated Cuban-Ira. Amp. de Yonides No. 1 to 2000 ft with a cable tool rig, and then with a rotary to at least 6000 ft.

This will be the first deep test in the old Motembo naphtha field, from which more than $1\frac{1}{2}$ million barrels of pure naphtha have been extracted since its discovery in 1881. So far no well in the area has been drilled to deeper than 3000 ft and most of the production comes from the zone from 400 to 1700 ft. Consolidated Cuban's location was made after extensive geological studies, and the object is to penetrate the serpentine and reach the underlying limestone. Geologists believe there could be an accumulation of crude oil over several thousand acres under the serpentine. Consolidated Cuban holds about 7000 acres in the heart of Motembo, including an area to the north of the old field that has never been drilled.

Oil Research and Developments in Australia

The following information is extracted from the December Oil Search Newsletter issued by the High Commissioner for Australia in the United Kingdom.

Western Australia

The four-year mapping programme for the Canning Basin by the Geological and Geophysical Sections of the Department of National Development's Bureau of Mineral Resources has been completed.

West Australian Petroleum Pty Ltd has completed its stratigraphic test at Yanrey in metamorphic basement rocks at 1395 ft. Yanrey lies about 35 miles north-east of Rough Range on Exmouth Gulf, and the company has also completed its seismic survey in the Meda area, 25 miles east of Derby. The seismic survey in the Samphire Marsh area between Port Hedland and Broome continues, and a gravity survey will commence shortly near Fitzroy Crossing in the Fitzroy Basin (Kimberley District).

The company has chosen a site, to be known as Learmonth No. 1, between the Rough Range and Cape Range structures on Exmouth Gulf for a stratigraphic test, and drilling is proceeding.

South Australia

Santos Ltd, drilling near Codnadatta, has reported minor showings of oil at 895 and 932 ft.

The Bureau of Mineral Resources has completed its seismic survey of the western part of the Great Artesian Basin which is held under prospecting licence by Santos Ltd.

Queensland

The Zinc Corporation Ltd, has completed a stratigraphic test five miles east of Weipa on the west coast of Cape York Peninsula.

The well was located on a gravity anomaly and was completed at a depth of 3243 ft without finding evidence of oil or gas.

However, a large flow of artesian water, estimated at 6,000,000 gallons daily, was found at 2400 ft which will be of great value in the development of the nearby bauxite deposits.

Associated Australian Oilfields N.L. and Frome-Broken Hill Pty Ltd are to drill a joint stratigraphic well near the south-eastern corner of the Gulf of Carpentaria.

Geological exploration by the Bureau of Mineral Resources has established the presence of Upper Cambrian rocks underlying the Ordovician in the area of Boulia in central-western Queensland, and has also disclosed that there is a progressive thickening of the early Palaeozoic formations towards the south. Some of the limestones in the sequence have been found to be petroliferous.

The Australian Oil and Gas Corporation Ltd has commenced a scout bore at Talbabla and is drilling at 675 ft.

New South Wales

The Australian Oil and Gas Corporation Ltd has spudded three wells in the Sydney Basin for geological information. They are Dural No. 2, drilling at 535 ft; Cameen No. 1, drilling at 235 ft; and a second structure bore at Morisset, drilling at 535 ft.

Victoria

Woodside (Lakes Entrance) Oil Co. N.L. has reported a show of oil at 1290 ft in the Oilco No. 1 well at Lakes Entrance. This was in the glauconitic sand from which small oil production was obtained in this region some years ago.

The Company's Hedley No. 1, near Woodside in south-eastern Gippsland, was drilling ahead at 3447 ft in sandstone with mudstone bands. No oil or gas has been reported.

Papua

Australasian Petroleum Pty Ltd and Island Exploration Co. Pty Ltd continued drilling in their two wells. Barikewa No. 1 was drilling ahead at 7992 ft and Komewu No. 1 at 6377 ft.

A new site about two miles from Komewu No. 1 has been prepared for drilling as soon as No. 1 is finished. An access road to a third location on the Kuru structure has been commenced.

Drilling has started at a location at Puri, about 25 miles N.N.E. of Wana.

General

The Commonwealth Government has introduced legislation providing for subsidies up to £A500,000 annually for four years to encourage drilling for stratigraphic information. This will be used to subsidize drilling by oil companies in areas not previously investigated at depth. Individual subsidies will be limited to not more than half the cost of each hole.

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Another Show of Oil in Nigeria

The fifth oil well drilled at Afam, near Port Harcourt, Southern Nigeria, has encountered oil. Since the first and third wells were also successful at Afam, Shell B.P. of Nigeria now have three productive wells in the structure. The second and fourth wells were dry holes.

On the other hand the seventh well to be completed at Olibiri, to the west of Port Harcourt, is a dry hole. There are now four productive wells at Olibiri and three dry holes. Appraisal drilling continues into both the Afam and Olibiri structures.

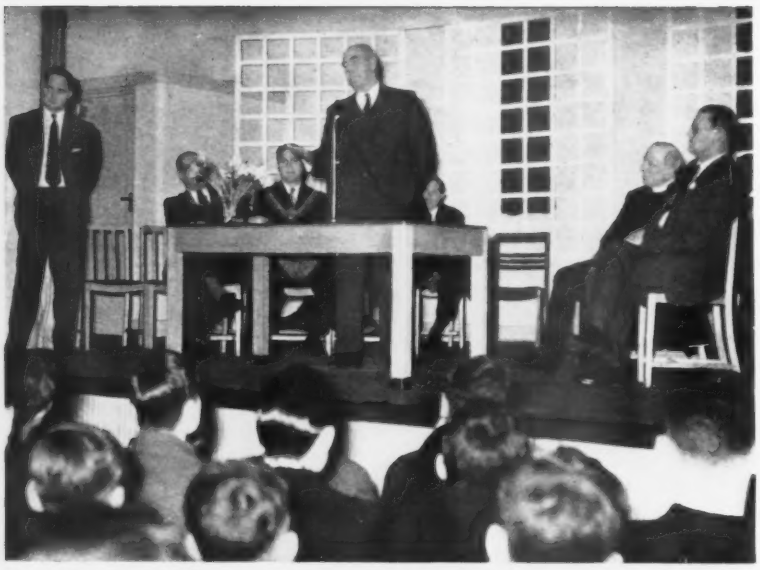
Construction of the pipelines from Olibiri and Afam to Port Harcourt is making good progress; the 30-miles long Afam line is expected to be completed by the end of 1957 and the 65-miles long Olibiri line, which has been held up by the unusually heavy rains, by March. Until the Olibiri line is completed limited quantities of Olibiri crude oil will be transported to Port Harcourt by barge. As soon as the Olibiri line is finished all four productive wells at Olibiri and the three at Afam, together with any other productive wells that may have been drilled by then, will be put on continuous test.

Petroleum Chemicals in France

Manufacture of petroleum chemicals at the BP Naphtachimie plant near Lavera refinery, Marseilles, has been increased by the enlargement of the cracking plant, which can now produce 18,000 tons p.a. of ethylene compared with 10,000 tons previously.

Naphtachimie was commissioned in 1953 for production of petroleum chemicals derived from feedstocks supplied by Lavera refinery, which is operated by BP's French associate, Société Francaise des Pétroles BP. This company also has a substantial holding in the Naphtachimie plant.

Christmas Lectures at Chatham



Group Captain Douglas Bader (left) *stands by while C. S. Cleverly answers a poser from one of the audience*

"Oil in the Air" was the theme of two Christmas lectures and a two-day exhibition organized by the South-Eastern Branch of the Institute and held in the Medway College of Technology, Chatham. The afternoon lecture on 2 January was confined to young people still attending school and about 400 were present. The lecture was given by Group Captain Douglas Bader, D.S.O., D.F.C., O.B.E., manager of Group Aircraft Operations Department of The Shell Petroleum Company Ltd. The evening lecture on the same day was by H. C. Denly, B.E.(Mech.), of the Technical Sales Department of the Esso Petroleum Company Ltd. His audience was composed of young people and adults.

Present on the platform at the first lecture, which was presided over by A. Chatting, South-Eastern Branch chairman, were the mayors of Chatham and Gillingham, the Bishop of Rochester, and other dignitaries. Also present were C. S. Cleverly and Dr T. Tait, manager and assistan manager respectively of BP's Isle of Grain refinery, Dr Henry Orr, Principal of the Medway College, S. D. Osborn, Area Youth Employment officer, J. Smith of Kent Education Authority, and J. R. Moore, honorary secretary of the Branch.

Opening the proceedings, Mr Chatting said that it was the first occasion on which the South-Eastern Branch of the Institute had broadened its activities to embrace people not actually engaged in the oil industry. Since the war the most important factor in a great upsurge of industrial activity in the Thames and Medway estuaries had been the appearance in north-west Kent of oil-refining interests. It was for these and their associated industries that the South-Eastern Branch had been established.

The Branch had proved a valuable medium through which

Colin Williamson, a member of the Branch Committee, explains the gas turbine to the Mayor of Chatham while a student takes it all in

A. Chatting, IP South-Eastern Branch chairman (left) *and the Mayor of Chatham and the Mayor of Gillingham* (right) *take further instruction from Group Captain Bader at tea time*

information pertaining to petroleum was brought within the reach of all those interested. Most important, it provided also a means of introducing the oil industry to students and giving them factual insight into the opportunities which it offered.

The Branch Committee had felt the time opportune to give some positive service to advanced students and school-leavers of the Medway towns. It was to them that they addressed themselves that afternoon and it was for them that the lectures and exhibition had been arranged.

The Institute was not alone in thinking that the effort to foster the interest of young people in the oil industry was of urgent importance. They were pleased to have had the assistance of some of the major British oil companies, and Mr Chatting particularly welcomed the presence of the Lord Bishop of Rochester and their Worships the Mayors of the Medway Towns as showing the civic interest in the affairs of youth. He also welcomed the interest and assistance of local industry and the education authorities.

Mr Chatting concluded by expressing his pleasure at seeing such a large assembly of young people. He then called upon Group Captain Bader to give his lecture.

Group Captain Bader kept his audience engrossed while he talked to them on the subject of the use of aircraft by an oil company and on the industry in general and on the opportunities it offered for satisfying employment. At the conclusion of his address, he spent some time in answering questions which covered all phases of the oil industry.

The subject of Mr Denly's lecture in the evening was "Oil in the Aero Engine". He traced the development from the piston engine to the modern gas-turbine engine. To assist him in demonstrating the principle of the latter, he made use of a sectioned full-size Rolls-Royce *Dart* engine, and this

Many of the audience were also autograph collectors—and the girls were no exception

evoked considerable interest from young and old. He dealt particularly with the fuel and lubricant requirements of the gas turbine and answered a number of pertinent questions at the conclusion of his talk.

The Exhibition

During the two days an interesting exhibition relating to the petroleum industry was staged by five companies. The exhibits are briefly described below:

Berry Wiggins & Co. Ltd.—The use of bitumen products for airfield runways, roads, buildings, and similar purposes was shown by examples of such application. Apparatus for testing bitumen

Around the exhibition

(Top left) *The shape of things to come—a forecast by Shell-Mex and B.P. of space ship fuelling in* 1984; (bottom left) *W. J. Grant of Shell's Thornton Research explaining a point in his demonstration;* (centre) *a glimpse of Esso's aircraft fuelling plan and part of their lubrication display;* (top right) *F. W. Martin, deputy chairman of the Branch, explains a display in the Berry Wiggins exhibit;* (bottom right) *a student ponders on the opportunities offered by British Petroleum*

and also road surfaces were exhibited and a scale model of the new No. 3 unit at the Company's refinery at Weasle was on view.

British Petroleum Co. Ltd.—This stand dealt particularly with aircraft fuelling, and developments leading up to the modern high-speed pumping techniques were illustrated. The need for care in preventing contamination of the fuel was demonstrated.

The Company's animated model of the air-stacking procedure used at London Airport was on display, together with a model illustrating fuelling throughout the ages. This model started in 1929 with a Handley-Page *Hannibal* and an Avro 504 being fuelled by can and funnel and concluded with a glimpse of the future.

A particularly important exhibit of BP was a series of panels showing the opportunities offered by the petroleum industry. These attractive panels were the subject of much study by the young people present.

Esso Petroleum Co. Ltd.—This Company's exhibit was mainly concerned with lubrication, the importance of which was stressed by means of charts and panels. A model was on view to illustrate the Company's suggestions for a service bay to service aircraft with fuel and lubricants. A full-size sectioned Rolls-Royce *Dart* turbo-prop aero engine was separately displayed.

Shell-Mex and B.P. Ltd.—Aircraft paints was the subject of this exhibit, and the exacting requirements of these materials were illustrated by means of panels. The rigorous tests applied to ensure the finish essential for high-speed flying were also illustrated.

Many of the materials used in the manufacture of these paints are derived from petroleum.

The Shell Petroleum Co. Ltd.—This display traced the development of aviation fuels from that used by Bleriot in his Cross-Channel flight in 1909 to those used in the modern gas turbine. It ended on a futuristic note by showing details of the rocket used in connexion with the Vanguard satellite. Another series of panels dealt with the scientific background of the industry and the career opportunities offered by the company for its operations at home and overseas.

Practical demonstrations of the testing of fuel sprays and other equipment were given by a member of the staff from Thornton Research Centre.

Film Show

During both days an almost continuous showing of the following films was given:

The Deep Blue Sky; Jungle Air Lift; The Oil Men; Foothold in Antarctica; Test Flight 263.

IGNITION QUALITY OF DIESEL FUELS

Secondary Reference Fuels

Since 1937 laboratories in Britain which have engines for testing the ignition quality of diesel fuels have used two secondary reference fuels designated HIQ (high ignition quality) and LIQ (low ignition quality). The original calibration of these fuels was described in 1938 (See *J. Inst. Petrol*, 1938, **24**, 70). The official values given to these fuels were 70½ and 18 respectively. After the war the calibration was checked and no change in value was found (see *J. Inst. Petrol*, 1949, **35**, 791).

The fuels were manufactured in the first place by the then Anglo-Iranian Oil Company Ltd who have been responsible for their storage and distribution during the past twenty years. Stocks are now almost exhausted and the Engine Tests Sub-Committee has given careful consideration to the question of their replacement. To ensure a sufficiently correct calibration of new reference fuels would necessitate testing on a larger number of individual engines than are at present readily available. It has therefore been decided to follow the practice of the Knock Rating Laboratories and adopt American secondary reference fuels. These are currently designated T.14 71·0 cetane number) and U.7 (24·0 cetane number). Supplies of these fuels are obtainable in barrel lots from Esso Petroleum Company Ltd, 15/17 Suffolk Street, London, S.W.1.

It is anticipated that official recognition will be given to the use of these fuels in Britain as from 1 March 1958, subject to some correlation checks which are now in progress by the Ignition Quality of Diesel Fuels Panel. The significance of the cetane number scale and the engine test methods employed were discussed last year (See *J. Inst. Petrol*, 1957, **43**, 64).

CORROSION CONTROL IN TANKERS

On 25 February A. Logan, O.B.E. is to present a paper on "Corrosion Control in Tankers" at the Institute of Marine Engineers, 76 Mark Lane, London, E.C.3. Tea will be available at 5.0 p.m. and members of the Institute of Petroleum are particularly invited to attend the meeting. Preprints will be available on application to the Secretary of the Institute of Marine Engineers.

C. C. WAKEFIELD & CO. LTD AND FLETCHER MILLER LTD

Following the completion, on 1 January 1958, of the acquisition of the Fletcher Miller Group by C. C. Wakefield & Co. Ltd, the following appointments have been made to the Boards of these two Companies, and to that of Wakefield-Dick Industrial Oils Ltd.

C. C. Wakefield & Co. Ltd
S. R. Miller (chairman, Fletcher Miller Ltd)
Wakefield-Dick Industrial Oils Ltd
A. George (director and secretary, Fletcher Miller Ltd)
R. T. Miller (director, Fletcher Miller Ltd)
Fletcher Miller Ltd
J. C. Cragg (manager, Stanlow Works, C. C. Wakefield & Co. Ltd)
J. W. MacMahon (general manager, Industrial Lubricants Division, Wakefield-Dick Industrial Oils Ltd)
L. J. Windridge (secretary, Wakefield-Dick Industrial Oils Ltd)

NEW NATIONAL BENZOLE APPOINTMENTS

National Benzole Co. Ltd have announced the following appointments with effect from 1 January 1958:—

West Riding Division
H. Lambert to be district manager, Sheffield District.
Southern Division
J. Poppleton to be district manager, Bournemouth District.
A. R. Carter to be district manager, Oxford District.
South Wales Division
S. R. Watts to be district manager, Eastern District.
T. F. Thomas to be district manager, Western District.
Liverpool Division
R. H. Quayle to be district manager, Merseyside & Cheshire District.
A. S. Hughes to be district manager, North Wales District.
London Division
J. F. C. Waters to be district manager, South West District.
H. A. Chesher to be district manager, North East District.
M. W Hardy to be district manager, North West District.
E. C. Anstee to be district manager, South East District.
Midland Division
C. L. Baker to be district manager, Potteries District.
J. E. Farnell to be district manager, Nottingham District.
D. A. Marshall to be district manager, Leicester District.
J. G. Wilson to be district manager, Birmingham District.

Personal Notes

Dr Heinz Heinemann

To assist in planning technical co-ordination and long-range research **Dr Heinz Heinemann** has joined the research department of The M. W. Kellogg Co., New York, a subsidiary of Pullman Incorporated. In this capacity he will be associated with Dr Alex G. Oblad, vice-president in charge of research and development.

Dr Heinemann is president of the International Congress on Catalysis, a former chairman of the Catalysis Club of Philadelphia, and the author of many patents and technical papers in the fields of catalysis, petroleum chemistry, carbohydrate chemistry, and the properties of adsorbents.

He was formerly with Houdry Process Corporation in charge of a research section, with several oil-refining organizations, and has served on the faculty of Carnegie Institute of Technology.

Dr Heinemann received a Ph.D. in chemistry from the University of Basle, and also graduated from the University of Berlin, and Technische Hochschule, Berlin.

J. S. Vesey Brown, a director of Mobil Oil Co. Ltd since 1949, has retired under the Company's retirement plan and **J. C. Dean** has been appointed to the Board.

Mr Vesey Brown has had a long service with Socony Mobil, having joined the Company after serving in the British army in the first world war. In 1940 he joined the Royal Norfolk Regiment with the rank of Lieutenant-Colonel and served as Co-ordinator of Petroleum Supplies for West Africa. In 1945 he was seconded to the Ministry of Fuel and Power and was awarded the O.B.E. for his services.

Mr Dean graduated from Lehigh and Yale universities with a Ph.D. in chemistry. He joined Socony Mobil in 1933 in the Research and Development Laboratories at Paulsborough. His wide experience has included Process Products, Lubricants, and the Chemical Products Division of the Lubricating Department. In May 1950 he was appointed industrial district manager of the Lubricating Department, and since then he has held appointments with Mobil Overseas Oil Co. Inc.

N. C. Lake has been appointed a director and deputy managing director of Head Wrightson & Co. Ltd. He will be responsible for the co-ordination of the group sales to the iron and steel industry. Mr Lake was formerly managing director of The Head Wrightson Machine Co. Ltd.

Douglas Dodds-Parker, M.P., has joined the board of The Head Wrightson Export Co. Ltd.

Anthony Neville has joined the Head Wrightson Export Co. Ltd of 20 Buckingham Gate, London, S.W.1. as manager—Europe.

He was formerly in the International Department of the British Iron & Steel Federation.

The following appointments, effective from 1 January, have been made by the National Benzole Co. Ltd.

R. F. Godden has become manager, Lubricants, in succession to C. W. Harrison who has retired.

L. H. Curtis has been appointed assistant manager, special trades, and **E. J. Drew** has been appointed assistant staff manager.

The Company have also announced that **J. E. Pearman,** formerly assistant divisional manager, Sheffield, has been appointed assistant manager (Dealer Sales Development) in their head office in London.

L. W. Abrey-Nutt has been appointed assistant divisional manager, West Riding Division.

C. W. Harrison, manager of the Lubricating Oil Department of the head office of the National Benzole Co. Ltd., since 1936, has retired.

Mr Harrison joined National Benzole in 1923 as depot superintendent at the Sheffield depot, and was appointed depot supervisor, Sheffield Division and Leicester depot in 1925. In the following year he was appointed depot inspector and in 1930 became marine superintendent of the Company's tanker fleet.

He held this appointment until he was promoted manager of the Lubricating Oil Department.

Lord Latymer has been appointed a director and elected as chairman of London and Thames Haven Oil Wharves Ltd, from 1 January in succession to the late H. A. Holmes.

H. C. Pitcher has been appointed construction manager of The M. W. Kellogg Co., New York, and he will be in charge of all Canadian and South American construction for the Canadian Kellogg Co. Ltd, and the Kellogg Pan-American Corporation of New York. He will also be in charge of the construction activities of Kellogg's Fabricated Products Division.

J. M. Nuttall, A.F.Inst.Pet., has been elected to the board of directors of Lubrizol Great Britain Ltd, from 1 January.

Mr Nuttall, formerly manager of Lubrizol's West German sales company, has his headquarters at the London office of Lubrizol Great Britain Ltd at 110 Strand, W.C.2. His primary function is the direction of sales in the United Kingdom.

A. E. Hope, M.I.Mech.E., M.S.A.E., F.Inst.Pet., currently a director of the Company, has been appointed commercial director and will deal with export, as well as home sales and other commercial activities.

Alfred Towle, also a director, will continue to manage the Lubrizol International Laboratories and technical service activities at "The Knowle", Hazelwood, near Derby.

Dr F. F. Musgrave, F.Inst.Pet., formerly commercial managing director, has left the Company to join Albright and Wilson Ltd.

G. W. Dunkley, O.B.E., B.A., M.Inst.Pet., has retired from the Boards of the Iraq Petroleum Co. and its associated

companies and **F. C. Ryland,** M.A., M.I.C.E., F.Inst.Pet., has been appointed executive director.

Mr Ryland was a scholar of Clare College, Cambridge, where he took first class honours in the Mechanical Science Tripos. From Cambridge he joined the civil engineering firm of Sir Robert MacAlpine & Son, and in 1925 entered the Public Works Department of the Sudan Government. He joined the Iraq Petroleum Co. in 1933 and was posted to the Middle East in 1934. He became pipeline superintendent in 1941 and deputy manager in charge of the Company's pipelines in 1947. In 1951 he was appointed general manager of the Kirkuk fields and pipelines and he came to the London office in 1953 as general manager in charge of services and planning.

Lester Mills, until recently manager of Petrofina (Gt Britain) Ltd's Midland Region has taken up appointment as manager of South-West Region at Gloucester, in succession to the late N. D. Roughsedge.

Sir Stephen Gibson, C.B.E., a past-president of the Institute of Petroleum, and **W. E. Eadie,** chairman of the Burmah Oil Company Ltd, were appointed directors of the Chartered Bank as from 1 January 1958.

Martin Eichelberger, geophysicist, recently with Geophysical Service Inc., has joined Aero Service Corporation, Philadelphia, as a representative of the company's Airborne Geophysics Division.

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Her Majesty's New Year Honours

Lord Geddes, C.B.E.

Members of the Institute will join in congratulating the President, **The Right Honourable Lord Geddes,** on his appointment by Her Majesty the Queen, in the New Year Honours List, as a Commander of the Most Excellent Order of the British Empire.

Neville Archibald Gass, C.B.E., M.C., chairman, British Petroleum Co. Ltd, has been created a Knight of the Most Excellent Order of the British Empire.

Mr Gass, who has been chairman of BP since 1 February 1957, joined the Anglo-Persian Oil Co. (now BP) in 1919 and served in Persia until 1934, latterly as deputy general manager. He was made a managing director in 1939 and became deputy chairman in April 1956. He was created C.B.E. in 1953.

N. A. Gass, K.B.E.

Other appointments and awards made by Her Majesty and of interest to the petroleum industry are:—

C.B.E.

Wilfred Neill Foster, Petroleum Technologist, Trinidad.

O.B.E.

Frank Edward O'Connor, formerly general manager (Pipeline and Terminal), Iraq Petroleum Co. Ltd.

Captain Roland George Mott, master, s.s. *British Glory*, B.P. Tanker Co. Ltd.

Captain R. G. Mott, O.B.E.

M.B.E.

George Francis Nicholas Anderson, M.B., B.Ch., senior medical officer with the Iraq Petroleum Co. Ltd in Qatar.

B.E.M.

Albert Edward Cracknell, chief steward, s.s. *Esso Saranac*, Esso Petroleum Co. Ltd.

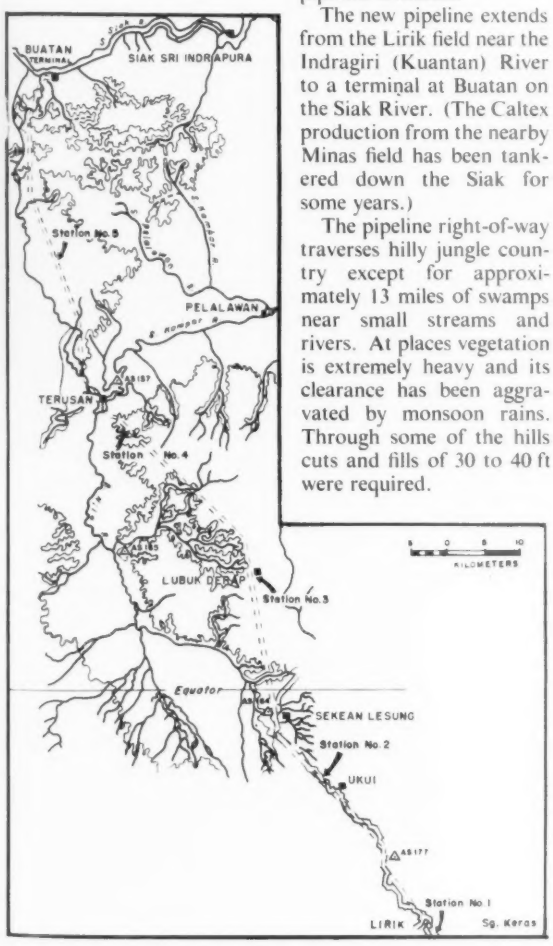
Ernest Howard Parsons, pumpman, m.v. *Hemisinus*, Shell Tankers Ltd.

90-Mile Tropical Pipeline

A unique crude-oil pipeline project, which Standard-Vacuum Oil Company is now laying across the equator in the jungle of central Sumatra, will early in 1958 increase the company's Indonesian production capacity by 20,000 barrels per day.

The eight-inch 90-mile pipeline, part of a four-year $80,000,000 Indonesian investment programme, is believed to be unparalleled. An accompanying hot-water "defroster" line will help it to handle an exceptional crude with a pour point of between 105° and 110° F.

The expansion programme includes the pipeline and roadway to a point on the Siak River accessible to ocean-going tankers, development of the company's Lirik producing field, and modernization and enlargement of its refinery at Sungei Gerong. The refinery is on the Musi River near Palembang in South Sumatra, about 475 miles from the pipeline terminus.



The new pipeline extends from the Lirik field near the Indragiri (Kuantan) River to a terminal at Buatan on the Siak River. (The Caltex production from the nearby Minas field has been tankered down the Siak for some years.)

The pipeline right-of-way traverses hilly jungle country except for approximately 13 miles of swamps near small streams and rivers. At places vegetation is extremely heavy and its clearance has been aggravated by monsoon rains. Through some of the hills cuts and fills of 30 to 40 ft were required.

Years of patient research and experiment—interrupted by a war—preceded an engineering solution to the problem of flowing the crude out of the jungle.

Stanvac engineers and technologists have been fascinated by the remarkable characteristics of the Lirik crude ever since they discovered the fields in 1939 and 1940. Overnight the crude congeals so hard that it can be cut into chunks with a knife in the morning but it liquefies in the direct rays of the equatorial sun. (The reservoir temperature in the Lirik field is relatively high. It reaches 173° F at 1700 ft subsurface, which corresponds to an extraordinary temperature gradient of less than 20 ft per degree, compared to a normal gradient of 60 ft per degree.)

This crude was found in the Kuantan River basin, approximately 40 miles inland from the nearest delta on Sumatra's east coast. The Lirik producing area itself, situated on low rolling hills, has a convenient topography for oilfield operations, and the climate is humid with an average of 115 inches of rain p.a. However most land east of Lirik is inundated during the rainy season and is unsuited for a pipeline route to a deep-sea terminal, but going north to the Siak, the pipeline is mostly on dry terrain.

Early plans for barging the field output to a deep-water terminal along the Kuantan were complicated by river conditions for the first 24 miles.

At least six ideas for transport were considered. A blend with 35 per cent naphtha or some equivalent solvent was found by test to be pumpable in a buried line, but it required a larger diameter pipeline, a terminal topping plant, and a system to return the solvent to the field.

Also discarded was emulsification with water because the crude tended to form stable emulsions not commercially separable.

Tests with glass tubes indicated success in moving the crude through a line as a solid plug riding within a sleeve of water, but this was not feasible in practice.

Excessive investment ruled out ideas of an electrically heated pipeline, or installation of "vis-breaking" equipment, which would amount to a cracking plant in the field to alter the crude's exceptional viscosities.

The best scheme appeared to call for heating the crude at various stations along the pipeline, and research concentrated on actual pumping tests as war approached.

First tests began in 1941 on an experimental six-inch pipeline 1¼ miles long at Lirik. It had a rated capacity of 9500 b.d. with facilities to heat the crude to temperatures up to 200° F. Before the Japanese occupation, the experiment yielded useful data on buried and unburied pipeline characteristics, pressure behaviour, heat loss, and other factors.

The Japanese drilled additional wells and laid a six-inch surface pipeline 35 miles between Lirik and Sungei Tjenako, on the Kuantan River, where barges could load. A two-inch steam line was laid parallel and wired to the crude line with an insulation of coconut husks. Heater stations served the defroster line every 2½ miles, without intermediate crude pumping stations. Sketchy information indicates the Japanese thus moved about 200,000 barrels.

In 1949 Stanvac put down a new six-inch 7-mile "pipeline to nowhere," which ran 3½ miles from Lirik and back to the storage tanks there. Pressure gauges and thermometers studded the line for intensive observations and a 1⅛-mile section was eventually buried from six to twelve inches deep with a two-inch hot-water defroster line.

From this first post-war project, Stanvac engineers acquired vital data which profoundly influenced design of the present pipeline.

During 1954 Stanvac buried a six-inch crude line on top of a two-inch defroster line between the Lirik producing field and Djapura, a barge-loading terminal on the Kuantan River four miles distant. About 2000 barrels a day began moving through this system in 1955 for trans-shipment to the Sungei Gerong refinery at Palembang. This is the fourth project (including one built and operated by the Japanese) from which the data have been accumulated for the design of the pipeline now nearing completion.

This temporary 2000 b.d. production comes from wells in the nearby Sago field. The defroster line is used only to restart pumping after shutdowns, as the preheated crude moves easily over the short four-mile stretch. Coil-lined shallow-draught barges haul the crude from Djapura 25 miles to Tjenako where, after reheating, the cargo is shifted into bigger barges for towing by ocean-going tugs.

The new Central Sumatra pipeline will have five pumping stations and a loading terminal spaced 18½ miles apart. A three-inch hot-water defroster line, laid beneath but in contact with the crude line, will operate at 1000 psi discharge pressure and 180 F initial temperature. The hot water is pumped in each direction to a point half-way between stations—a start-up procedure lasting from thirteen to nineteen hours, depending on weather conditions.

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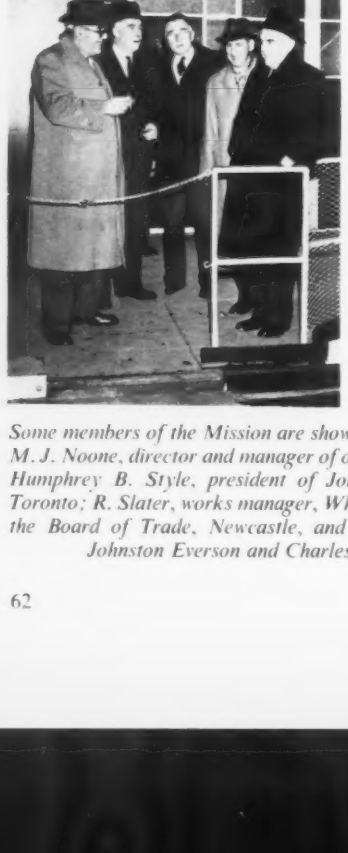

On 9 December a section of the Canadian Trade Mission visited the Darlington works of Whessoe Limited, well-known suppliers of storage tanks, plant and equipment to the oil, gas, chemical, and nuclear power industries. Some members of the Mission are shown above. (Left to right) *M. J. Noone, director and manager of operations, Whessoe Ltd; Humphrey B. Style, president of John Inglis and Co. Ltd, Toronto; R. Slater, works manager, Whessoe Ltd; R. A. Jolly of the Board of Trade, Newcastle, and J. George Johnston of Johnston Everson and Charlesworth, Toronto*

IP LAUNCHES NEW CORRELATION SAMPLE SCHEME

Check samples for engine testing to be generally available

During the last war the various oil companies operating in the U.K. were encouraged by the Ministry of Aircraft Production to organize an informal scheme for the regular interchange of samples of aviation fuel. Each laboratory could then regularly check the performance of its equipment for weak mixture and rich mixture rating of such fuels against the average results obtained in all laboratories on "practical" fuels, instead of having to rely solely on the rating of standardization fuels prepared from *iso*-octane, *n*-heptane, benzene, and TEL.

After the war the scheme was extended so that motor gasoline and diesel fuel samples were circulated in a similar way and eventually some thirty laboratories were regularly receiving samples. In addition, a number of enquiries have been received by the Aviation, Motor, and Diesel Fuel Panels of Sub-committee No. 5 from European oil companies, research organizations, and other official bodies about the possibility of their participating in these correlation schemes, or at least of their receiving similar samples of the fuels.

Consideration of how participation by overseas laboratories could be arranged has emphasized the need for a general reorganization of the scheme, irrespective of the extent of overseas participation. For instance, the burden of preparing and circulating samples and correlating test results has up to now fallen quite heavily and unfairly on the five or six "founder" members of the scheme. The Institute has therefore decided that the old arrangements should be replaced by a scheme somewhat similar to the National Exchange Group which is operated in the U.S.A. by ASTM in association with the U.S. Bureau of Mines.

The new scheme will be administered by the Institute of Petroleum from 61 New Cavendish Street, London, W.1., and requests for participation are invited. An annual subscription of £18 will entitle members to receive a series of twelve monthly ½-gallon samples of either motor gasoline, aviation gasoline, or diesel fuel. The fuels will be chosen, within their general classification, to represent the various grades encountered in normal testing and from time to time special blends recommended by the Panels of Sub-Committee No. 5 will be issued. The ratings obtained by members will be returned to the IP on forms provided and will be analysed statistically. Copies of the analysis of results on each sample, showing average rating, the deviation of each rating from the average, and the standard deviation of the ratings will be issued promptly to every subscriber so that he may derive maximum benefit from the information.

The sample size of ½ gallon has been chosen for reasons connected with transport of the samples and if the IP supercharge test is to be applied it may be necessary to subscribe for duplicate or even triplicate series of samples. Samples will be delivered carriage paid to their destination in England, Scotland, or Wales in non-returnable containers. In the case of samples required by overseas laboratories or organizations, a U.K. agent must be nominated to whom the samples can be delivered; subsequent arrangements for export of the samples to their overseas destination will be the joint responsibility of the overseas participant and his U.K. agent.

A number of companies have already expressed the intention of using samples originating under this scheme to replace their present arrangements for circulating samples to their overseas laboratories for correlation purposes. Each laboratory will thus have a direct "key-in" to the general body of engine testing results. To permit full use to be made of these facilities, air transport of samples may be necessary; sample size will be restricted to ¼ gallon and suitable containers and packages are being sought. The same annual subscription of £18 will apply to supplies by air.

It is proposed to issue the first set of samples during April 1958, and requests for these, together with subscriptions must be received by the IP before April 1. These samples should be tested during June and the results received by the IP before 30 June. Analyses of the results will be issued within the first 10 days of July. This cycle of issue, testing, and reporting will then continue at monthly intervals. New or additional subscriptions for twelve months may be taken out in July, October, January, or April of any year.

Around the Branches

BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD

Essex Branch

The Essex Branch has completed the first half of its 1957/58 programme, and has enjoyed an interesting series of meetings which have been well attended.

The season opened on 27 September when S. Parr gave an interesting talk on "Lighterage on the Thames", in which he described the considerable changes in type of craft and cargo handled over the years. A film, *Thames Tideway*, which followed, formed an excellent pictorial adjunct to the talk.

On 1 November Professor E. S. Sellers gave a talk entitled "The Petroleum Industry in A.D. 2000" After initially scaring many members of the audience by presenting on a blackboard a complex algebraic equation, Professor Sellers gave a lucid discourse on world oil reserves and consumption and proceeded in a logical manner, with many amusing observations on the likely size of the oil industry in A.D. 2000, depending upon whether one pinned one's faith on the reserves predictions of Pratt or of Lees.

Discussion was opened by D. Vickery (Shell) and the many and varied questions which followed were adequate testimony of the appreciation of Professor Sellers' lecture and of his delightful manner of presentation.

The Atomic Energy Authority loaned their film *Calder Hall*, which made a suitable epilogue.

L. Holliday spoke, on 22 November, on the "Petroleum Chemical Industry in Great Britain and the United States". In a most interesting lecture, he said that petroleum was a very important source of raw materials for the manufacture of organic chemicals, and that the position had now been reached where about 80 per cent of the organic chemicals produced in the U.S.A. (versus 30 per cent in the U.K.) had a petroleum origin. To a certain extent, he stated, progress in the United States could be regarded as a signpost to the future in the United Kingdom. Mr Holliday discussed the important differences in the approach of the two countries to the petrochemical industry as the result of differences in the availability of important raw materials.

Following an animated discussion initiated by L. C. Neill (Mobil), the meeting concluded with a showing of the film *The Plastics Industry*.

On 6 December J. J. Darley gave his talk (postponed from 11 October) on "Problems involved in the Design of Hydrodesulphurization Processes".

After a brief description of the basic principles of a hydrodesulphurization process, Mr Darley proceeded to enumerate the problems facing the designer of such a process. The choice of materials to resist hydrogen and hydrogen sulphide attack at elevated temperatures and pressures was discussed, along with such other problems as welding techniques with steels which are resistant to such attack, *e.g.* high Cr/Ni alloys. Reactor design was dealt with and the effect upon design of process variables such as temperature, pressure, space velocity, and recycle gas was considered in detail. Mr Darley concluded his lecture by reviewing maintenance, safety, and atmospheric pollution aspects of such processes.

This talk evoked great interest as was shown by the subsequent spirited discussion which was initiated by J. W. Bartholomew (Mobil), and which had to be cut short on account of lack of time.

Fawley Branch

On 29 November N. L. Falcon, chief geologist of the BP Exploration Co. Ltd, gave a very informative and interesting talk on "Oil Searching in the U.K.".

Mr Falcon explained that oil indications and seepages in Britain had been known for many hundreds of years; they occurred in rocks of Carboniferous age in the Midlands and in the Midland Valley of Scotland, and to a less degree in the Jurassic and Lower Cretaceous rocks of Southern England. The first serious exploration took place in 1918–22 and was Government sponsored; it resulted in the discovery of one very small field in the East Midlands (Hardstoft). The Petroleum Production Act of 1934, which nationalized Britain's oil, initiated an exploration campaign which was still in being. Only BP had worked throughout the whole period, having been fortunate in discovering a group of small commercial fields in the East Midlands, of which the Eakring/Duke's Wood field, found in 1939, was the first and the largest. Maximum BP production was 112,717 tons in 1943, after which it fell to 43,428 tons in 1948 when the introduction of secondary recovery methods (water flooding) raised it again to about 55,000 tons in recent years. The discovery of two more fields in the last three years has raised potential production to near the 100,000 tons mark again. Total production from all fields had reached 1,000,000 tons in 1956. Exploration in the Midland Valley of Scotland had only resulted in minor discoveries of natural gas. A small oilfield had been found at Formby in West Lancashire but this was a secondary seepage accumulation; the primary accumulation in spite of a considerable exploration effort still eluded discovery. Exploration in Southern England continued, but no commercial success had yet been obtained. U.K. oil exploration provided for BP an invaluable training ground for personnel entering the industry. All normal exploration methods and techniques were used—geological studies, geophysical surveys seismic refraction and reflection, gravity, and magnetic,

electric logging services, etc. Although operations were on a small scale they were on a commercial basis largely because indigenous hydrocarbons received preferential tax treatment. Exploration was likely to continue for some years and the discovery of a number of new small fields could be expected.

Drilling for oil had produced a mass of new data on sub-surface geology, and discovery of coal, potash, and natural gas had been made as a by-product. Several small gas fields had been found, the best being in the Magnesian Limestone of Permian age in north-east Yorkshire. Large accumulations of oil and/or natural gas had never been anticipated in Britain, because of the nature of the geology.

A lively discussion led by Harry James followed, and a very enjoyable evening was rounded off with a vote of thanks for the lecturer, proposed by Cyril Banyard.

South-Eastern Branch

A meeting of the Branch was held on 12 November 1957 at the King's Head Hotel, Rochester, when W. A. Partridge of the British Petroleum Company spoke on "The Manufacture of Aviation Gasoline".

Mr Partridge said many people imagined that with the growing popularity of jet aircraft, the demand for aviation gasoline would fall off rapidly, but in fact it was generally agreed that demand for aviation gasoline would continue to rise until well into the 1960s, after which it would remain steady for about a decade before falling gradually.

Mr Partridge went on to deal in some detail with the specifications for the different grades of aviation gasoline. Early aircraft flew on almost any light petroleum fraction, but as time went on and aero engines were further developed it was found necessary to limit the fuel more and more closely. Thus, as well as the familiar weak and rich mixture ratings, aviation gasolines are rigidly controlled in their boiling range, volatility, gum-forming propensities, and calorific value. As well as meeting all these specification points, of course, the fuel must be free of corrosive matter, be immiscible with water, and have a very low freezing point. As the speaker remarked, "If an aeroplane engine stops you can't get out to look under the bonnet and see what's gone wrong!" For this reason, the oil companies frequently made their specifications more rigorous than were actually required.

Mr Partridge showed how the various refinery products and processes fitted into the scheme of aviation gasoline manufacture and finished with a caustic comment on airfield operators who used this very carefully made and valuable liquid as a washing spirit!

After a number of questions a vote of thanks to Mr Partridge was carried with acclamation. A break for refreshments was followed by the showing of the Shell Film Unit production *High Speed Flight* which deals in a very interesting and lucid manner with the problems encountered in the design and operation of aircraft at speeds approaching that of sound.

Scottish Branch

A meeting of the Branch was held in the Recreation Hall of BP refinery (Grangemouth) Ltd on 19 December 1957.

J. M. Caldwell, J.P., chairman of the Branch, introduced a paper on "Automation in the Oil Industry", by S. W. J. Wallis and D. S. Townend.

The authors reviewed current methods of control of refinery processes and discussed developments and trends in instruments and the need for a fundamental change of approach to process control.

They considered that successful operation of any organization depended on correlation of information, communication, evaluation, and action, the four basic functions. The importance of these functions as applied to process control was examined and four basic deficiencies of present-day control systems were exposed, namely that control of product quality was indirect, faithful performance of each individual control loop was essential, long time-lags arose from sampling and testing routine, and the operator had to assimilate and relate information from a large number of variables.

Present-day developments aimed to eliminate these shortcomings but a new approach in their application was needed. New trends should enable a process plant to be built and operated to make the most economical use of raw materials, and modern trends should also go a long way towards achieving the so-called push-button plant.

The paper discussed measurement and control of product quality, centralization and simplification of information presentation, data reduction and computing, and the use of electronics as a control medium.

The authors also considered the possibilities of completely automatic plant, and two methods of operation of a master control of such a plant were suggested.

After Mr Townend had answered several questions he was accorded a very cordial vote of thanks, proposed by the chairman.

London Branch Film Show

The 1957 Film Show of the London Branch was as popular as this feature has been since its inception several years ago. In fact it is now so popular as one of the main social functions of the Branch, that it is always necessary for the Committee to arrange two performances, and the accompanying photographs taken at the "light refreshment" session which followed the showing of the films leave no doubt as to enjoyment shared by all.

So, on 6 and 13 December, the Mezzanine Cinema at Shell-Mex House was filled almost to capacity, the only empty seats being due to illness and similar causes.

Three oil company films were shown and covered a wide range of interest. The first—*Rivers of Time*—produced by the Iraq Petroleum Film Unit, is an interesting historical study of the Sumarian and Arab civilizations, dating back to the beginning of time. The second—*Route des Cimes*—showed in a spectacular way the

hazards undertaken daily by the driver of a BP road tanker in conveying a load of fuel from Chambery to the village of Val d'Isere 5560 ft up in the French Alps. Finally, in *Song of the Clouds*, the Shell Film Unit brought to the screen the story of part played in civil aviation by the two international air organizations, IATA (International Air Transport Association) and ICAO (International Civil Aviation Organization).

At the conclusion of each evening a vote of thanks to Shell-Mex and B.P. Ltd for their courtesy in making the cinema available and in providing hospitality was carried with acclamation.

At the London Branch Film Show

South Wales Branch

On 14 November A. C. Hartley, C.B.E., the Branches' lecturer for the session, visited Llandarcy to give a lecture on "Operation Pluto".

The chair was taken by Dr L. S. Thornes.

Mr Hartley, opening, expressed his pleasure at returning to Llandarcy where part of the initial work on PLUTO took place. His lecture recalled the sense of urgency surrounding the project which became a vital aspect of the second front plan.

Experiments were first carried out at Westward Ho! on loading small tankers through short sea lines but this was found to be hazardous and the quantities loaded limited.

Attention was then devoted to the development of a pipeline based on the cable-forming technique and Messrs Siemens Bros produced the first length which was laid by the cable layer *Alert* into the Medway. Pumping tests revealed leaks and highlighted the problem of coupling which was eventually solved.

It was decided to make a large experimental lay from Swansea to Watermouth Bay and in April 1943 the line was commissioned and delivered motor spirit into the west country.

While the development of the cable line proceeded, success was achieved also with the steel pipe idea developed by Messrs Hammich and Ellis when for the first time it was demonstrated that steel pipe was flexible enough to be wound. Fabricated lengths were eventually wound upon huge bobbins called "conuns" which could be towed behind tugs.

Carefully camouflaged pumping stations were built at Dungeness and elsewhere in readiness for "D Day".

Altogether 172 million gallons of motor fuel were pumped from England to the Continent.

Mr Hartley illustrated his talk with films taken by himself. Through his enthusiasm he communicated to his audience once more the magnitude of the task and the manner in which it was solved by co-operative effort.

The vote of thanks proposed by Professor Sellers, Swansea University, was most heartily supported.

Petroleum in Parliament

British Petroleum Co. Ltd New Loan

In reply to questions on 12 December the Economic Secretary to the Treasury said that Her Majesty's Government would not subscribe to the new loan being raised by the British Petroleum Co. Ltd.

If all the new stock was converted in 1958 and 1959 the voting rights of the Government would be just under 51 per cent, compared with 55 per cent in mid-December 1957.

International Convention on Oil Pollution

On 18 December Mr Neave, Joint Parliamentary Secretary to the Ministry of Transport and Civil Aviation, said that none of the countries whose ships flew flags of convenience, and whose ships accounted for about 13 per cent of world tonnage, had yet ratified the International Convention on the prevention of pollution of the sea by oil.

Those countries had been asked their intentions and further approaches would be made. The Ministry would bear in mind an idea that the large oil companies, when chartering ships, should make ratification of the Convention a condition of charter.

Port Facilities for Large Tankers

On 18 December the Minister of Transport and Civil Aviation said that ships of 104,500 dw tons and larger could be berthed at the facilities projected at Milford Haven and at those now being built at Finnart.

Liquid Methane Imports

In a written reply on 20 December the Paymaster-General said it was the ocean transport of liquid methane which had yet to be proved and it was with that end in view that experimental shipments would be made in a small oil tanker now being converted. Only if the experiment was a technical success and confirmed the economics of the project would the building of a full-scale liquid-methane tanker be considered.

Asked the anticipated cost per therm of gas produced from liquid methane the Minister replied that on present expectations the cost per therm of gas from large-scale imports would be less than the cost of coal gas. Future developments in the gasification of low-grade coal might considerably reduce the cost of gas made from coal, but detailed comparison between the two methods must await further research.

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Exhibitions and Conferences

Fuel Efficiency in the Melting and Thermal Treatment of Metals

A one-day meeting, organized by the Institute of Metals, is to be held at the College of Technology, Gosta Green, Birmingham, on 26 February, starting at 10.30 a.m.

It will take the form of an informal discussion on Fuel Efficiency in the Melting and Thermal Treatment of Metals, and there will be introductory addresses by F. C. Ashen of the Metals Division of ICI Ltd, who will deal with all aspects of the subject except electric heating, and P. F. Hancock, of Birlec Ltd, who will deal with electric furnaces.

No admission tickets are required, and interested IP members will be welcome to take part in the discussion.

San Francisco Chemical Industry Symposium

Five papers related to atomic reactors and high-energy fuels for rockets are among the papers to be given at the Chemical Industry Symposium of the National Association of Corrosion Engineers' 14th Annual Conference at San Francisco from 17–21 March. There will be a technical programme of 84 formal papers and more than 70 technical committee meetings.

In addition to the symposium on the chemical industry, other symposia will be given on pipeline corrosion, refining industry, protective coatings, oil and gas production, inhibitors, cathodic protection, high-temperature problems,

utilities, plastics, high-purity water, marine exposures, pulp and paper, and the aircraft industry.

An exhibition will be held concurrently with the conference.

Polytechnic Courses in Management

During the spring term the Department of Management Studies of the Polytechnic, Regent Street, London, W.1 is offering several one-meeting-a-week courses of interest to business executives. Lectures will be held either in the morning or afternoon and brief details of some are given below.

Course	*Duration*	*Starting date*	*Time*
Management Accounting ...	15 weeks	20 February	2–5 p.m.
Restrictive Trade Practices	10 weeks	24 February	2–5 p.m.
Presentation of Accounting Information	5 weeks	26 February	2–5 p.m.
Modern Incentive Schemes	12 weeks	5 March	2–5 p.m.

In the evenings there are two courses of special note. The first, for senior executives, is on "Communication in Management", consists of 12 lectures, from 6–8 p.m., and starts on 6 February. The second is composed of eight seminars on "Industrial Marketing" to be held from 6.15 to 7.15 p.m. from 24 February.

In addition there are one-day conferences on 11 February to consider "Materials Handling", and on 4 March "The Consequences of Automation".

Further details can be obtained from The Registrar, St Katherine's House, 194 Albany Street, London, N.W.1.

Packaging Conference

A 2½-day conference under the title "Packaging and Profit" has been organized by the Institute of Packaging and will be held at the Grand Hotel, Eastbourne from 24–26 April.

The conference is divided into four sessions, dealing respectively with "Packaging—a Top Management Problem", "The Package Executive", "The Package and Packaging", and "The Packaging Executive and Profit".

At the opening session the speaker will be F. J. Erroll, M.A., M.I.E.E., A.M.I.Mech.E., M.P., Parliamentary Secretary to the Board of Trade.

The papers will be presented from two points of view, those of the Board Room and the Packaging Executive, and representatives of a wide variety of industries will speak.

The conference has a four-fold theme:—

(1) To establish the relationship between the Board of directors and the packaging executive.

(2) To establish the position of the packaging executive in relation to his colleagues.

(3) To show how the packaging executive ensures that the right package is used and distributed in the most economical manner.

(4) To show how modern packaging can reduce overhead expenses and cut production costs.

Further information can be obtained from Maurice Paynter, F.C.C.S., The Institute of Packaging, 20–21 Took's Court, Cursitor Street, London, E.C.4.

Liège International Fair

Open from 10–26 May, the tenth Liège International Fair will be the only industrial fair to be held in Belgium in 1958.

Primarily devoted to four main sections, dealing respectively with mining equipment, metals, mechanical, and electrical engineering, the fair will include an International Exhibition of Industrial Safety Devices which will be concurrent with the Second World Congress for the Prevention of Occupational Accidents to be held in Brussels and Liège from 19–24 May.

In the 1957 fair there were 500 exhibitors from 16 countries and visitors totalled 250,000.

Further details of the fair and the special facilities for foreign visitors are obtainable from the U.K. Representative, R. C. Liebman, 178 Fleet Street, London, E.C.4.

Conference on Mass Spectrometry

A Conference on Mass Spectrometry is being organized by the Mass Spectrometry Panel of the Institute of Petroleum Hydrocarbon Research Group and Committee E-14 of the American Society for Testing Materials and will be held in London from 24-26 September 1958.

The venue will be the Beveridge Hall, Senate House, University of London, Gower Street, London, W.C.1. and further details are obtainable from Dr R. R. Gordon, chairman of IP Mass Spectrometry Panel, National Coal Board, Coal Research Establishment, Stoke Orchard, Cheltenham, Gloucestershire.

World Power Conference Sectional Meeting

A Sectional Meeting of the World Power Conference will be held in Montreal from 7–11 September 1958.

The theme of the meeting will be "Economic Trends in Production, Transportation, and Utilization of Fuel and Energy". Sixteen papers will be presented by the British National Committee, and details of six papers of special interest to the oil industry are given below:

Changing Pattern of Demand for Oil Products and its Effect on Refinery Output, by M. E. Hubbard, B.A., M.I.Mech.E., F.Inst.Pet., of the British Petroleum Co. Ltd.

The Effective Use of Fuel Resources through Gasification, by J. E. Davis, O.B.E., F.R.I.C., M.Inst.Gas.E., and C. Ryder, M.Sc., of the South Eastern Gas Board.

Economic Trends in the Design of Thermal Power Stations in the United Kingdom, by J. T. Moore, B.Sc., A.R.I.C., M.I.C.E., M.I.Mech.E., A.M.I.Mar.E., F.R.S.A., of Ewbank and Partners Ltd.

The Use of Oil as a Means to Greater Productivity by T. C. Bailey, M.Inst.Pet., F.Inst.F., and R. J. Bressey, M.A., B.Sc., F.Inst.Pet., F.Inst.F., of Shell-Mex and B.P. Ltd.

Recent Trends in the Utilization of Gas and their Probable Economic Effects, by S. G. Aberdein and A. E. Tyrell of North Thames Gas Board.

Capital Requirements for the Use of Energy, by G. H. Daniel, D.Phil., B.Sc., Under-Secretary, Ministry of Power.

Copies of the general programme, which will contain full data on the Conference, technical visits, and post-conference tours, with membership and other application forms are obtainable from the Secretary, British National Committee, World Power Conference, 201 Grand Buildings, Trafalgar Square, London, W.C.2.

A Sectional Meeting will also be held in Madrid in 1960 on the invitation of the Spanish National Committee.

The Sixth Plenary Meeting of the Conference will be held in Australia in 1962, and a Sectional Meeting will take place in Switzerland in 1964.

New Books

Britain in the Second Half of the Twentieth Century

The Federal Educational and Research Trust, whose trustees include Lord Beveridge and Sir Adrian Boult, have issued a series of pamphlets dealing with the contemporary problems that confront British trade, and speculating on future prospects.

The first of the series, by Sir Cecil Weir, K.C.M.G., K.B.E., M.C., for three years head of the U.K. delegation to the High Authority of the European Coal and Steel Community, is concerned with the origin, organization, and achievements of the Community in the seven years since its creation was proposed by M. Robert Schuman on behalf of the French Government in May 1950.

The external relations of the Community and the attitude of the U.K. Government are examined in a subsequent chapter and a chronological history of the Community since its inception concludes the booklet.

The second pamphlet, entitled *Europe—the Next Steps*, by Paul Bareau, a noted economist and broadcaster, examines the post-war developments in Europe that paved the way for the establishment of a common market for six Continental countries—West Germany, Italy, France, Netherlands, Belgium, and Luxemburg. Special attention is given to the treaty signed in Rome in 1957 by the Foreign Ministers of the six countries, in which it was agreed to have a common external tariff, common policies for agriculture, transport, and labour mobility, and common institutions for economic development. Separate chapters are devoted to the attitude of Britain to the common market and the question of sacrifice of sovereignty by closer association with Continental countries. The author concludes that although the Free Trade Area is not yet a reality, there is enough practical and emotional momentum to ensure the success of the project.

Two other pamphlets discuss the feasibility of an Atlantic Union and the question of development of the Commonwealth.

Barbara Ward, formerly assistant editor of *The Economist*, looks boldly forward into Britain's future in the final pamphlet which has the title *Forty Years On*.

All the booklets are priced at 1s. 6d. and may be obtained from the Federal Educational and Research Trust, 20 Buckingham Street, London, W.C.2.

Gas for Scotland

Conceived originally merely as a "popular version" of the Scottish Gas Board's annual report for the year ended 31 March 1957, *Gas For Scotland* has been expanded to publicize two additional points—the importance of the gas industry in the nation's economy and the new opportunities for service it affords.

Emphasizing that Britain must use her home-produced fuel to the best advantage, the booklet recalls that more useful heat is ultimately derived from a ton of coal processed by the carbonization industries than by any other means of conversion, and many valuable by-products also accrue.

The gas industry's awareness of new technical developments is attested by some of the sources of supply, existing or projected, within the Scottish Gas Board's area. These are plants for transformation of small high-ash coal into high-pressure gas, gasification of low-grade coal, and the use of coke-oven gas, colliery methane, and natural gas.

Although much has been achieved, much remains to be done in serving the community. Perhaps the most trenchant comment occurs at the end of the first section of the booklet where it is claimed that if the people of Scotland took full advantage of the facilities offered by the gas industry, prices, even while inflationary tendencies persisted in other industries, could be reduced to an even lower relative level.

The second section discusses the availability of coke in smoke-control areas. Apart from its obvious advantage as a smokeless fuel, coke has a higher heating efficiency. Properly burned 16 cwt of coke gives as much heat as 1 ton of coal, an appreciable saving both in quantity and price. An interesting fact that emerged from a survey on an Edinburgh Corporation housing estate was an almost 100 per cent favourable public reaction to coke-burning fires. Much however remains to be done in promoting general adoption of such appliances.

Copies of the booklet can be obtained from the Gas Council, 1 Grosvenor Place, London, S.W.1.

Britain and Europe

This book is claimed to be the first attempt by an independent organization to analyse the effect on British industry of the European common market with or without a free trade area in which Britain would be the leading participant.

The book's main aspect is to assess the impact of European free trade on British industry, and it is concluded that manufacturers as a whole will be considerably better off with a free trade area than with a common market alone. Of the industries studied, covering some 85 per cent of total manufacturing industry, those likely to be adversely affected by 1970 within a free trade area account for less than 15 per cent of the output.

The industries probably better off within a free trade area include: motor vehicles and chemicals (output estimated 10–20 per cent more by 1970 than if there is a common market only); wool, electrical engineering, general engineering, and rubber manufactures (output 5–10 per cent more); steel, hosiery, and clothing (output up to 5 per cent more). The following industries should also gain: non-ferrous metals, metal manufactures, aircraft, ship building, oil refining, building materials, glass, scientific instruments, and sports goods. Cotton, rayon, paper, leather, and watches and clocks are likely to lose; the prospects for china, footwear and toys are somewhat doubtful. Railway engineering, jute manufactures, and furniture should be little affected.

Apart from the greater intra-European trade following from the abolition of tariffs and quotas and from fairer competition, there should be a general quickening of the growth of national incomes and production.

If there is a common market and no free trade area, British competitive power will be blunted not only in Europe but also in overseas markets where the Continentals, and particularly the Germans, will become increasingly strong.

Within a free trade area Britain would share with Germany the advantages of a highly developed and diversified manufacturing industry in which the average size of firm is, by European standards, large. The level of wages should not be a disadvantage to British industry. Those in Scandinavia and Switzerland are higher; in Belgium and France they are in the same range; and in Germany they will not be much lower after the initial arrangements of the common market have

come into effect. Only in Austria, Holland, and Italy will they remain significantly lower. In general, wage differences are counter-balanced by differences in productivity.

The worst handicap faced by the U.K. is the low rate of investment and economic growth. While foreign, especially U.S., investment should be attracted to Britain, as a member of both European and Commonwealth preferential trading areas, the only fundamental solution is a politically acceptable method of restraining consumption in order to leave more to invest. Success in a free trade area will also depend on the energy and skill put into designing, selling, and servicing goods for the European market.

The Britain and Europe Fund, which commissioned The Economist Intelligence Unit Limited to carry out the survey for the book, was sponsored by leading bankers, industrialists, and economists.

Contributors to the fund included 64 industrial and commercial firms, 11 banks, 13 trades unions, 5 trades associations, one chamber of commerce, and a number of other organizations.

Copies of the book, at the price of 16s. post free, are obtainable from The Economist Intelligence Unit Ltd, 22 Ryder Street, London, S.W.1.

Oiling the Wheels

Using the most vivid and contrasting colours and with a draughtsmanship reminiscent of Heath Robinson, Peter Kneebone, the artist whose humorous drawings have appeared in the *Radio Times*, in addition to other publications, caricatures twelve modern industries in *Oiling the Wheels*, a new book issued by Shell-Mex and B.P. Ltd.

The full-page full-colour illustrations exhibit an astonishing detail and ingenuity and are placed facing a sober factual, though rather brief, account of each industry being surveyed. One figure is constant to all the drawings. He is a sad bowler-hatted chap who looks like Alec Guinness as a disillusioned French farceur—and NOT (Mr Kneebone insists) the foreman. A second feature that appears in all the drawings is a bird (NOT a Picasso symbol of industrial conciliation) who survives even an unequal encounter with a cuckoo clock with not a feather ruffled.

Originally produced for a series of advertisements, the pictures have excited world-wide acclaim. From almost every European country (including East Germany), from Egypt, from Sierra Leone, from the Antipodes, and from the United States have come appreciative comments. From the first to the final article there are many details to catch the eye and draw a smile from the most harassed executive.

The opening article on glassmaking, which reminds us that the manufacture of glass is almost always regarded as the work of a gifted individual—an archetypal craftsman—contrasts with Kneebone's drawing which includes a blue-spectacled portly man, blowing what appears to be an outsize lamp bulb so energetically that his cheeks gleam scarlet in an already brilliant pink face.

The final article, the thirteenth in the book, deals with automation in industry. The text points out that the DSIR definition includes all technical developments that make automatic production more possible, which it is remarked could have equally well been applied to some of the manifestations of the Industrial Revolution.

Kneebone, however, introduces certain unusual refinements of automation, yet to be seen in industry. A roll of music, attached to an electronic cabinet, is interpreted by a mechanical orchestra, consisting of drum, cymbals, violin, trumpet, and horn, all operating without a conductor, but presumably in the greatest harmony. The inscription on the dais where they are positioned is "Music while you DON'T work".

A robot egg fryer and teamaker attends to the wants of a workman contentedly dozing in a chair with his feet resting on the machine. Across the floor scurries a clockwork cat chasing a clockwork mouse.

But the colours compel the greatest attention. In one corner of the room stand a group of white-coated scientists examining some electronic instruments. Their coats, however, have fallen open to reveal one wearing olive-green trousers and an orangy waistcoat, a second with the same orangy waistcoat and grey trousers, and the third is distinguished by yellow shoes!

The book was produced in the hope that it would oil not only the wheels of industry but of mirth and it certainly seems likely that this hope will be fulfilled.

Copies can be obtained from Shell-Mex and B.P. Ltd, Shell-Mex House, Strand, W.C.2.

Colorado Oil Shales

The U.S. Secretary of the Interior, Fred A. Seaton, has recently given more information about oil-shale deposits in a portion of the Piceance Creek Basin in Rio Blanco County, Colorado. He confirmed that they may have a higher oil content and greater bed thickness than previously believed.

His statement was based on analyses by the Bureau of Mines of drill cuttings from oil and gas wells in the area. Studies indicated continuous oil-shale beds from 780 to 1980 ft thick, assaying an average of 25 gallons of oil per ton. A square mile 1980 ft thick would contain 2¼ thousand million barrels of oil.

The table shows that the top of the 25-gallon-per-ton material lies from 505 to 1770 ft deep. Surface elevations range from 6000 to 7100 ft.

THICKEST CONTINUOUS OIL-SHALE SECTIONS AVERAGING 25 GALLONS OF OIL PER TON

	25-gallon-per-ton shale sections	
Company, well, and location	*Thickness, feet*	*Depth of top of section, below surface of earth, feet*
Carter Oil Co.		
Square S Herring 1, 11-1s-97w ...	1070	1250
Equity Oil Co.		
Brennen 1, 20-2s-97w	1470	550
Pat Johnson 1, 27-2s-97w ...	1498	752
Sulphur Creek 1 Govt, 24-2s-98w	1260*	740
Sulphur Creek 2, 19-2s-97w ...	1775	530
Sulphur Creek 3, 23-2s-98w ...	1906	710
Sulphur Creek 4 Fee, 27-2s-98w...	1495*	505
General Petroleum Corpn.		
Piceance 5-31-G, 31-1s-96w ...	780	1770
Yellowcreek 26-25, 25-1n-99w ...	960*	1240
Yellowcreek 51-28, 28-1s-97w ...	1450	660
The Ohio Oil Co.		
Ryan's Creek 1, 34-1s-98w ...	1980	920

* Short sampled section; hence the indicated thickness is low. The shale grade exceeds 25 gallons of oil per ton.

Trade Literature, etc.

Wakefield's New London Showroom

A new showroom in Grosvenor Street, London, W.1, has been opened by C. C. Wakefield & Co. Ltd.

It provides a permanent display of lubrication equipment, both mobile and static, suitable for works and transport vehicle lubrication and which is marketed by the company, in addition to its well-known range of lubricants.

Whessoe Review

Articles in a recent issue of *Whessoe Review* describe a system of remote indication of storage tank contents levels, plant supplied for the new gas works at Exeter, and a new plate press at Whessoe's Darlington works.

Copies of the pamphlet are obtainable from Whessoe Ltd, Darlington.

Washing Without Water

A new waterless wash station is claimed to save 11 minutes of productive time per man/day.

Introduced by Deb Chemical Proprietaries Ltd, Belper, Derbyshire, the self-contained movable unit needs no plumbing. It consists of a visible level container of a waterless skin cleanser mounted on a steel cabinet and provided with two dispensers for paper towels.

It is particularly suitable to provide washing facilities for outdoor workers, hitherto always a difficult problem.

Anti-corrosion Coating

A new booklet has been issued describing the characteristics and uses of an anti-corrosion coating that has been widely employed by oil companies, chemical plants, and foodstuff factories and which has been adopted by the Admiralty for fuel stowage linings.

Copies of the booklet are obtainable from Sales Department, Arthur Holden & Sons Ltd, Bordesley Green Road, Birmingham, 9.

New Anti-Icing Compound

Universal Oil Products Co., Des Plaines, Illinois, U.S.A., has introduced a new anti-icing compound which is claimed to be more effective and economical in severe carburettor icing conditions than the normal alcohol type.

The new compound is instantly miscible in the lightest components of high-vapour pressure winter-grade gasolines, and has detergent properties that help to keep fuel-induction systems clean.

It is also an effective rust and corrosion preventative for use in refinery processing equipment, distribution, and storage facilities.

New Factory for Solartron

Work has started on the first stage of Solartron's £1¼ million 5-year expansion plan for increasing their production capacity at Tower Hill, Farnborough, Hants.

The first section of the final building of 350,000 sq. ft on the 15-acre site will be ready for occupation by August 1958, and will have an area of 50,000 sq ft.

It will be one of the finest factories in Europe and will house comprehensive manufacturing facilities in the fields of electronics, electro-mechanics, hydraulics, pneumatic and precision mechanical engineering. The first products will include radar simulators for NATO, the Solartron electronic reading automatons (ERA), industrial control equipment to facilitate automation, and units for building flexible analogue computers and simulators for atomic reactor design.

The factory is being constructed by Taylor Woodrow Construction Ltd, and will be a forward-looking designed building, using the Arcon monitor roof of Taylor Woodrow (Building Exports) Ltd, and a new type of clad walling designed by Raglan Squire & Partners, Hobart Place, S.W.1., the architects, engineers, and surveyors.

The manufacture of electronic instruments will remain at the Thames Ditton and Kingston factories of the Solartron Electronic Group Ltd.

Scale-free Furnace Heating

Recently issued is a new illustrated leaflet on scale-free heating of furnaces. It deals with the Equiverse system developed by The Incandescent Heat Co. Ltd of Smethwick, from whom copies can be obtained.

Kent Continental New Address

Kent Continental Société Anonyme, the Belgian subsidiary of George Kent Ltd, Luton, have moved into new premises at 27 rue Paul-Emile Janson, Brussels. The telephone number, Brussels 38.31.84 is unchanged, but an additional line has been added with the number 37.78.15. The telegraphic address is now Kentinental, Brussels.

Industrial Instrument Panels

To meet demands for standardized industrial instrument panels two basic types are being offered by George Kent Ltd, Luton.

The plate type is manufactured in sections up to 10 ft wide with sides, rear, and roof welded in position.

The unit type allows great flexibility and can be made any length by adding components as required.

Packing Bottles of Samples

A great aid to the speedy and neat packing of sample bottles is provided by the use of "Resil" resilient packing units.

They comprise two shells or moulds of a size suitable for the bottle, which when closed give complete protection in transit; the units can also be used for return of empty containers, if required.

Resil units are handled by the Pontefract Box Co. Ltd, 7 Sicilian Avenue, Southampton Row, London, W.C.1.

Refinery Equipment Construction

The high standard of modern refinery equipment construction is pictorially emphasized in a brochure dealing with a new refinery in Kentucky.

Copies are obtainable from Procon Inc., Des Plaines, Illinois, U.S.A.

New Oil-Dilution Measuring Instrument

E.M.I. Electronics Ltd, of Wells, Somerset, have introduced a new oil-dilution measuring instrument. It replaces present methods of measuring dilution of lubricating oil by diesel and other fuels which are carried out by viscosity or flash-point methods, and it is claimed that the new instrument needs no skill from the operator.

Readings can be taken every five minutes, the accuracy ranges between ± 1 per cent for 1 to 15 per cent dilutions and ± 2 per cent for 15 to 20 per cent dilutions.

The sample volume can be specified by the customer between 15 and 100 ml, and the ruggedness is also according to requirements.

Newcastle Office for Cape Asbestos

The Cape Asbestos Co. Ltd and their subsidiary, Cape Building Products Ltd, have opened a new office at 19 and 20 Exchange Buildings, Quayside, Newcastle-upon-Tyne (Telephone: Newcastle 20488).

The office is part of the Cape Asbestos Northern Area which is served by J. F. Callaghan, Northern Area manager, from Manchester. The Cape Building Products Northern Area manager is J. A. Fitzpatrick.

New Earth-Moving Equipment

Euclid (Great Britain) Ltd announce that two additional machines are now available to British users. They are a 4-wheel, 21 cu. yd diesel scraper, and a 27-ton rear dump unit with diesel engine and optional torque converter and torqmatic transmission: a 235 h.p. crawler tractor with torqmatic drive will be available in mid-1958.

Details of all these models may be obtained from the exclusive distributors in the United Kingdom, John Blackwood Hodge & Co. Ltd, 25 Berkeley Square, London, W.1.

New Oil for Two-Stroke Engines

A new lubricating oil for two-stroke engines has been introduced by Shell-Mex and B.P. Known as the Shell 2T Two-Stroke Oil it is the outcome of extensive laboratory experiments at the Shell Research Centre at Thornton, Cheshire, and trials in various types of two-stroke engine.

The new oil is primarily for delivery through the Company's Petroiler Service and, mixed with the correct proportion of petrol, the prices of the new mix (in the Inner Price Zones) vary from 5s. 1d. a gallon to 8½d. a pint.

Laboratory Furniture and Fittings

Two illustrated leaflets describe a range of laboratory apparatus from fluorescent balance lamps, analytical weights, and glassware to metal work benches which are durable, portable, and contemporary in stylling.

Further details are available from Griffin & George Ltd, Ealing Road, Alperton, Middlesex.

The Hydrocyclone

Liquid-Solid Separations Ltd, 2 Anderton Street, London, S.W.3, have published descriptive sheets on the hydrocyclone and the laboratory hydrocyclone test set.

The apparatus, used for separation of different-sized solids in liquids, is a wet centrifuge into which the suspension to be treated is introduced under pressure.

Very fine particle separations are achieved, and the hydrocyclone is effective in degritting and desliming because any floc is broken up.

A wide range of sizes is available, with capacities of from 1 to 2000 gallons per minute.

Synthetic Rubber Plant at Hythe

Matthew Hall & Co. Ltd have commenced construction of the 50,000 tons p.a. synthetic rubber plant at Hythe, Hampshire, for the International Rubber Co.

As sub-contractors to Blaw-Knox Co. of Pittsburgh, Matthew Hall & Co. Ltd have already carried out the design and procurement contract for this plant which is expected to cost about £5 million.

New Temperature Recorder

Ether Ltd have introduced a new temperature recorder for measurements from up to six independent points

It incorporates a conventional galvanometer, a chart and chart-drive mechanism, recording mechanism, automatic ribbon mechanism, and an automatic station selector and indicator.

The chart can run continuously for 30 days or at speeds of ½ inch per hour, and a hinged-front top plate allows easy chart loading.

The completely new scanner-commutator has shown no variation in contact resistance after 5 million revolutions and will permit another 5 million revolutions before servicing is necessary.

Details are obtainable from the Company at Tyburn Road, Birmingham 24.

Measurements without Physical Contact

Both in research and industrial production accurate measurements are sometimes required where physical contact with the specimen is impractical.

This difficulty is overcome by use of an electronic instrument, known as a proximity meter, that operates on the principle of measurement of the capacitance charge induced by small mechanical displacements.

The meter is extremely versatile and has been employed recently in such problems as assessment concentricity of ball races, measurement of magneto striction, carbon deposits, and the eccentricity of revolving shafts.

As a dielectric comparator it can detect moisture in powdered PVC, measure change of dielectric constant of a material during polymerization, and reveal impurities in oils.

It has great sensitivity and movements of less than 0·00001 inch can be registered in mechanical displacement.

An illustrated explanatory booklet on some of its multifarious applications has been produced by Fielden Electronics Ltd, Wythenshawe, Manchester 22, who also manufacture a comprehensive range of precision measuring instruments.

Fire-resistant Water-base Hydraulic Fluids

The Mobil Oil Co. Ltd has recently issued an illustrated instruction leaflet on their range of water-base fire-resistant fluids.

After listing the conditions requiring use of such fluids, including the three possible sources of ignition, the booklet gives the physical characteristics and the results of a series of tests on the Mobil products.

Installation and maintenance of the fluid in a hydraulic system, and its control during use are discussed in separate sections and a graph demonstrates the dilution of the fluid needed for any given viscosity reading.

Copies of the leaflet, Industrial Technical Bulletin No. 25, can be obtained from Mobil Co. Ltd, Caxton House, London, S.W.1.

Amalgamation of National Benzole Divisions

From 1 December 1957 the Leeds and Sheffield Divisions of the National Benzole Co. Ltd have been amalgamated into a West Riding Division.

The Divisional Offices are in Sheffield and the Divisional manager is D. A. Dunbar.

New Pyrene Agreement

An agreement has been signed whereby the Pyrene Co. Ltd of Brentford have acquired additional trade marks, patents, sales, and manufacturing rights hitherto owned by the American Pyrene Co. This will enable the British Company to develop a substantial export market in South and Central America, and a number of European countries, where trading has hitherto been restricted.

New Address

Wayne Tank and Pump Co. Ltd have moved to new premises at Western Road, Bracknell, Berks. Their new telephone numbers are Bracknell 1600–1609.

Solenoid Gas Valves

An illustrated data sheet describes two new miniature glandless gas valves, in addition to a standard range of sizes from BSP ⅛ inch to 6 inches.

Safety-switch and by-pass valves are also described, and copies of the leaflet are obtainable from Black Automatic Controls Ltd, Leafield, Corsham, Wilts.

Extended Market for Atomics Instrument

Developed for, and previously reserved only for sale to the atomic energy industries the George Kent Mark 2A electronic Multelec recorder is now generally available.

It can be used for temperature measurement (thermocouple or resistance thermometer); direct millivoltage recording; industrial measurements depending on a radioactive source and ionization gauge, such as of level, material thickness, density, etc; and research work.

Many of these instruments have been made for Calder Hall "A" and "B" and Chapel Cross "A" and "B" atomic power stations and for the heavy-water reactors at Harwell, Dounreay, and Sydney, Australia.

Dust Collection and Control

An illustrated leaflet has been issued describing a range of dust-collection and control plant suitable for dealing with most industrial pollution problems.

Copies are obtainable from W. C. Holmes & Co. Ltd, Turnbridge, Huddersfield.

New Steam Trap Manual

A comprehensive new manual on the principles, manufacture, sizing, installation, and applications of steam traps has recently been published.

Profusely illustrated with photographs, diagrams, and graphs, the manual is a compendium of information.

Sections are devoted to inspection and maintenance, including repairs and reassembly, and to trouble location and correction.

Among the many useful tables is one on the properties of saturated steam at pressures from 1 to 600 p.s.i.

Copies can be obtained from the Drayton Regulator and Instrument Co. Ltd, West Drayton, Middlesex.

Forthcoming Meetings

THE INSTITUTE
(*At the Institution of Electrical Engineers, Savoy Place, London, W.C.2, 2.30 p.m.*)
Symposium on Insulating Oils. **5 March**
(*At 61 New Cavendish Street, London, W.1., 5.30 p.m.—tea 5 p.m.*)
Electrostatics and Explosion Hazards in the Petroleum Industry. Dr A. Klinkenberg. **2 April**

IP ECONOMICS AND OPERATIONS GROUP
(*At 61 New Cavendish Street, London, W.1., 5.30 p.m.—tea 5 p.m.*)
The Fuel Economics of Public Road Transport. A. T. Wilford. **13 February**
Development of Nuclear Power. J. A. Jukes. **13 March**
1957 and its Implications for the Oil Industry. J. Senior. **10 April**

IP ESSEX BRANCH
(*At the Railway Hotel, Pitsea, 7.30 p.m.*)
Liquefied Petroleum Gas. K. R. Garrett, M.Sc., F.R.I.C., A.F.Inst.Pet. **14 February**
Recent Developments in the Gas Industry. L. J. Clark, B.E.M., M.Sc., M.I.Mech.E., M.Inst.Gas.E., A.M.I.C.E., A.M.I.E.E., M.I.Chem.E., A.F.Inst.Pet. **28 February**
Operation of a Small Refinery in the U.K. A. Cluer, B.Sc. A.R.I.C., A.M.I.Chem.E., M.Inst.Pet. **21 March**

IP FAWLEY BRANCH
(*At Esso (Fawley) Recreation Club, Holbury, 7.30 p.m.*)
Annual General Meeting and Film Show. **14 February**
Joint Meeting with the Royal Institute of Chemistry
Non-destructive Testing of Materials. J. R. Baddiley, B.Sc. **14 March**
Recent Developments in Gas Making Processes. A. E. Haffner, A.R.C.S., F.Inst.Fuel, M.Inst.Gas Eng. **11 April**

IP LONDON BRANCH
(*At 61 New Cavendish Street, London, W.1, 6 p.m.—tea 5.30 p.m.*)
Annual General Meeting.
Additives for Lubricants. G. H. Thornley, M.Sc. **28 February**
Luncheon Meeting. **19 March**
(*At 61 New Cavendish Street, London, W.1, 6 p.m.—tea 5.30 p.m.*)
The British Aircraft Industry. Edward Bowyer, C.B.E. **27 March**

IP NORTHERN BRANCH
(*At Engineers' Club, Albert Square, Manchester, 2 6.30 p.m.*)
Using Films in the Oil Industry. R. F. Leach, M.A. **11 February**
Subject to be announced. **18 March**

IP SCOTTISH BRANCH
(*At Recreation Hall, BP Grangemouth Refinery, 7.30 p.m.*)
Using Films in the Oil Industry. R. F. Leach, M.A. **20 February**
Joint Meeting with Stirlingshire and District Section of R.I.C. and S.C.I. **20 March**

IP SOUTH-EASTERN BRANCH
(*At Medway College of Technology, 7.45 p.m.*)
Joint Meeting with Royal Institute of Chemistry. **4 March**
(*At the King's Head Hotel, Rochester, 7.45 p.m.*)
The Work of a Public Relations Officer. D. E. Doyle, A.M.Inst.Pet
Film: *Rhythm on the Rails.* **1 April**

IP SOUTH WALES BRANCH
(*At the Training Centre, BP Refinery (Llandarcy) Ltd, 5.30 p.m.*)
Annual General Meeting and Debate. **13 February**
Joint Meeting with the Institute of Fuel
Oil Fuel Applications with Special Reference to South Wales T. Chippindale, A.M.I.Chem.E., M.Inst.F. **13 March**

IP STANLOW BRANCH
(*At the Grosvenor Museum Lecture Theatre, 7.30 p.m.*)
Joint Meeting with the Royal Aeronautical Society
Aircraft Fuelling Problems. E. L. Bass, M.I.Mech.E., F.R.AeS., F.Inst.Pet. **12 February**
(*At Blossoms Hotel, Chester, 7.30 p.m.*)
Joint Meeting with the Institute of Fuel
Coal and Oil as Partners in Energy Supply. R. R. Gordon, M.A., Ph.D. **19 February**
Handling Symposium:
Bulk. M. D. Ray, A.F.Inst. Pet.
Packages. M. Ingram, M.Inst.Pet.
Stocks Accounting. N. B. Gilmour. **19 March**

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Young graduate required for the Development and Research Laboratories (at Stratford, London, E.15) of a company producing bitumen and manufacturing bitumen compounds of all kinds. Good working conditions including pension scheme. Salary commensurate with experience and qualifications. Write in first instance to Technical Director, Berry Wiggins & Co. Ltd, Field House, Breams Buildings, Fetter Lane, London, E.C.4.

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A summer course on "Oilfield Reservoir Engineering" will be held in the University of Birmingham from 7 July to 1 August 1958. The course, which will be residential, will comprise lectures by members of the Petroleum Production Department of the University and specialist lectures from Industry, including, in particular, the British Petroleum Company Limited. Further information can be obtained from H. Gilmour, Petroleum Production Department the University, Edgbaston, Birmingham, 15.

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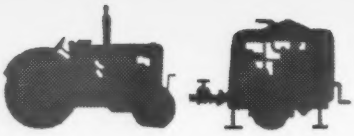

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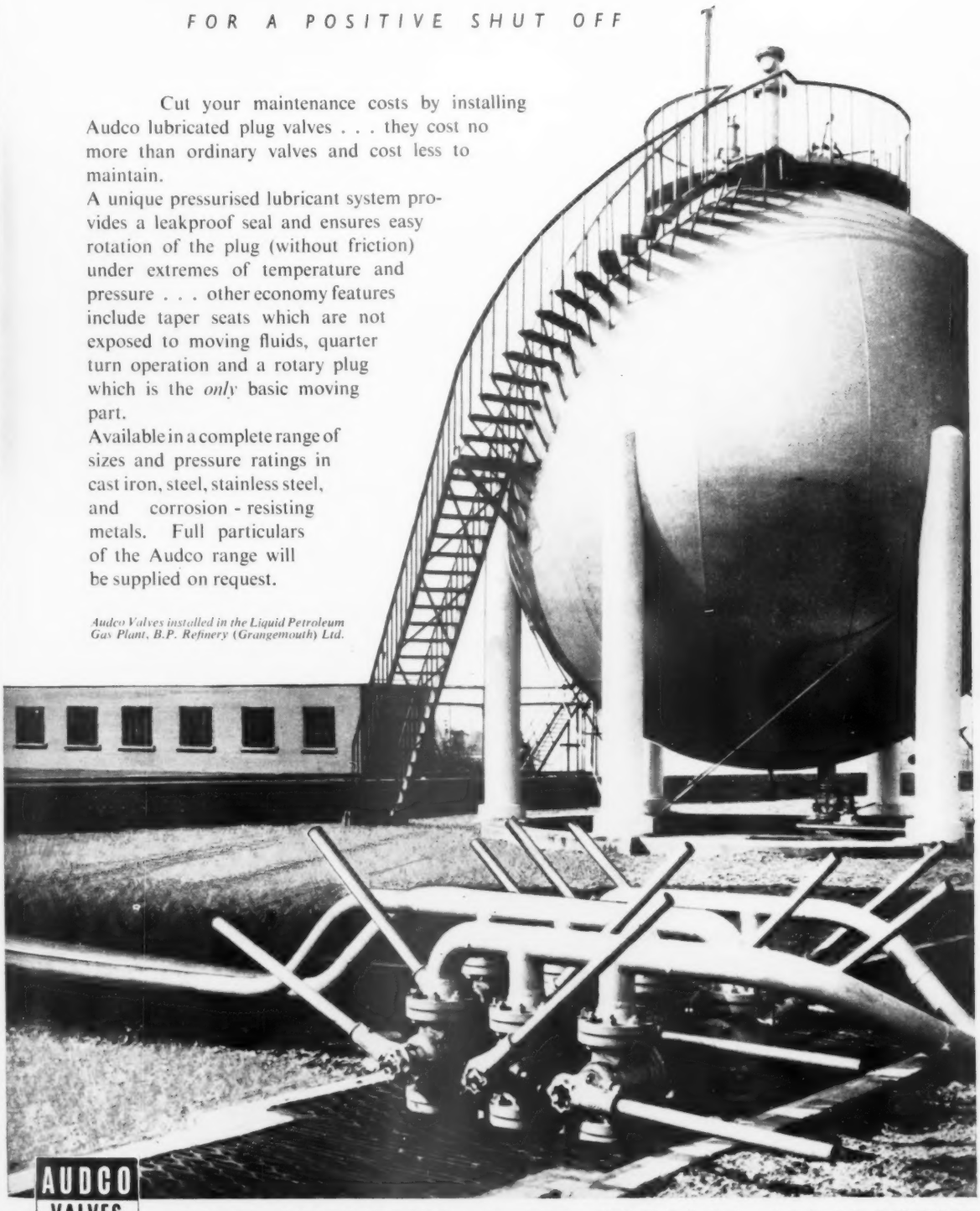

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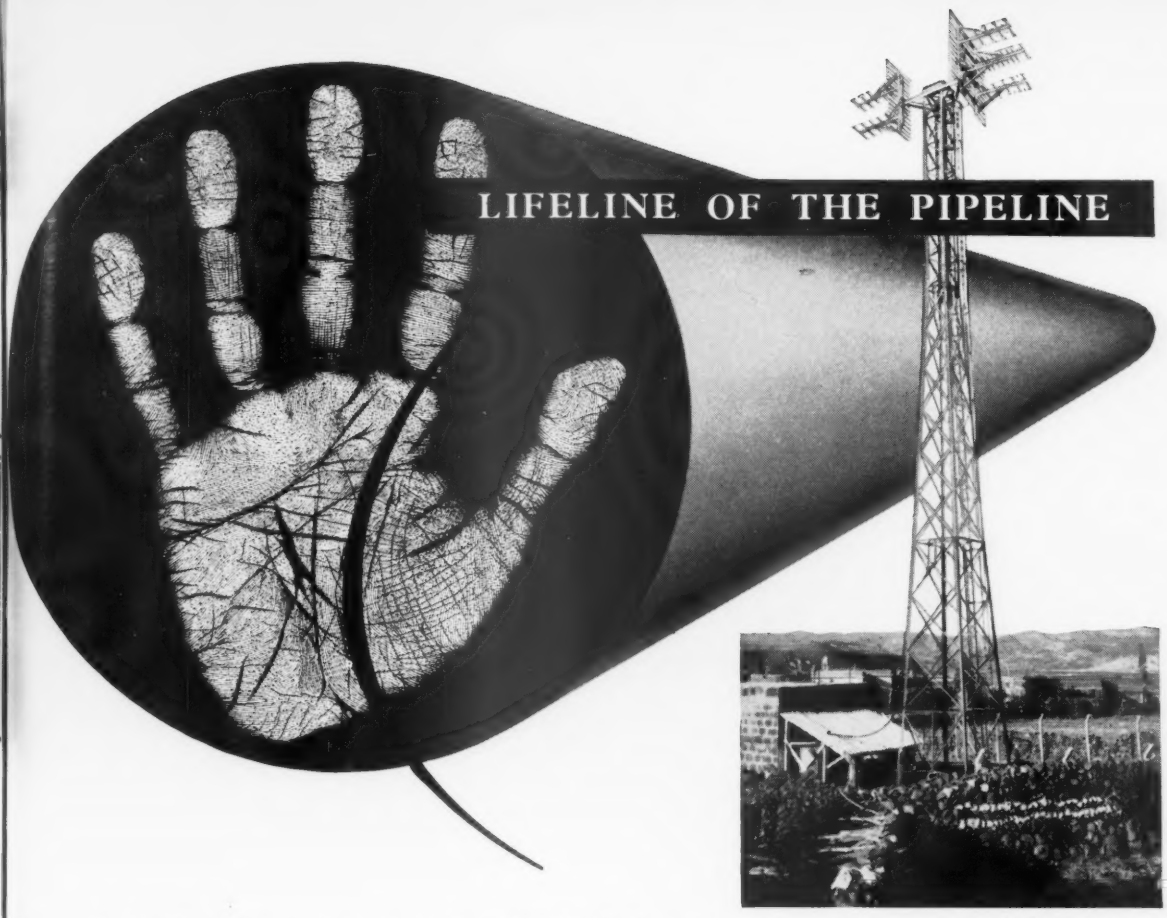

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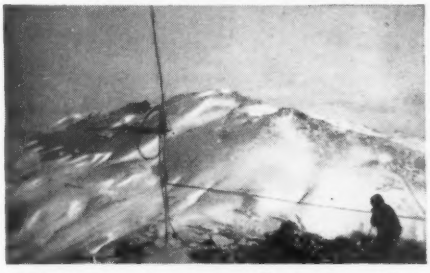
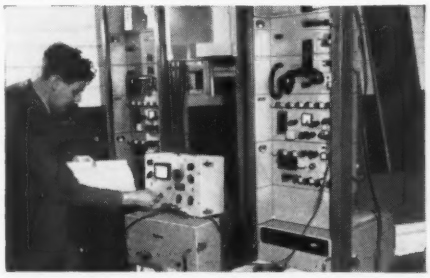


A Marconi survey engineer tests for signal strengths at a lonely mountain site during the radio-propagation survey along the trans-Iranian pipeline route.



Development work at Chelmsford on HM 181 VHF multi-channel equipment. Eighty-four of these will be supplied for the trans-Iranian scheme.

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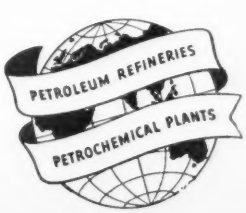

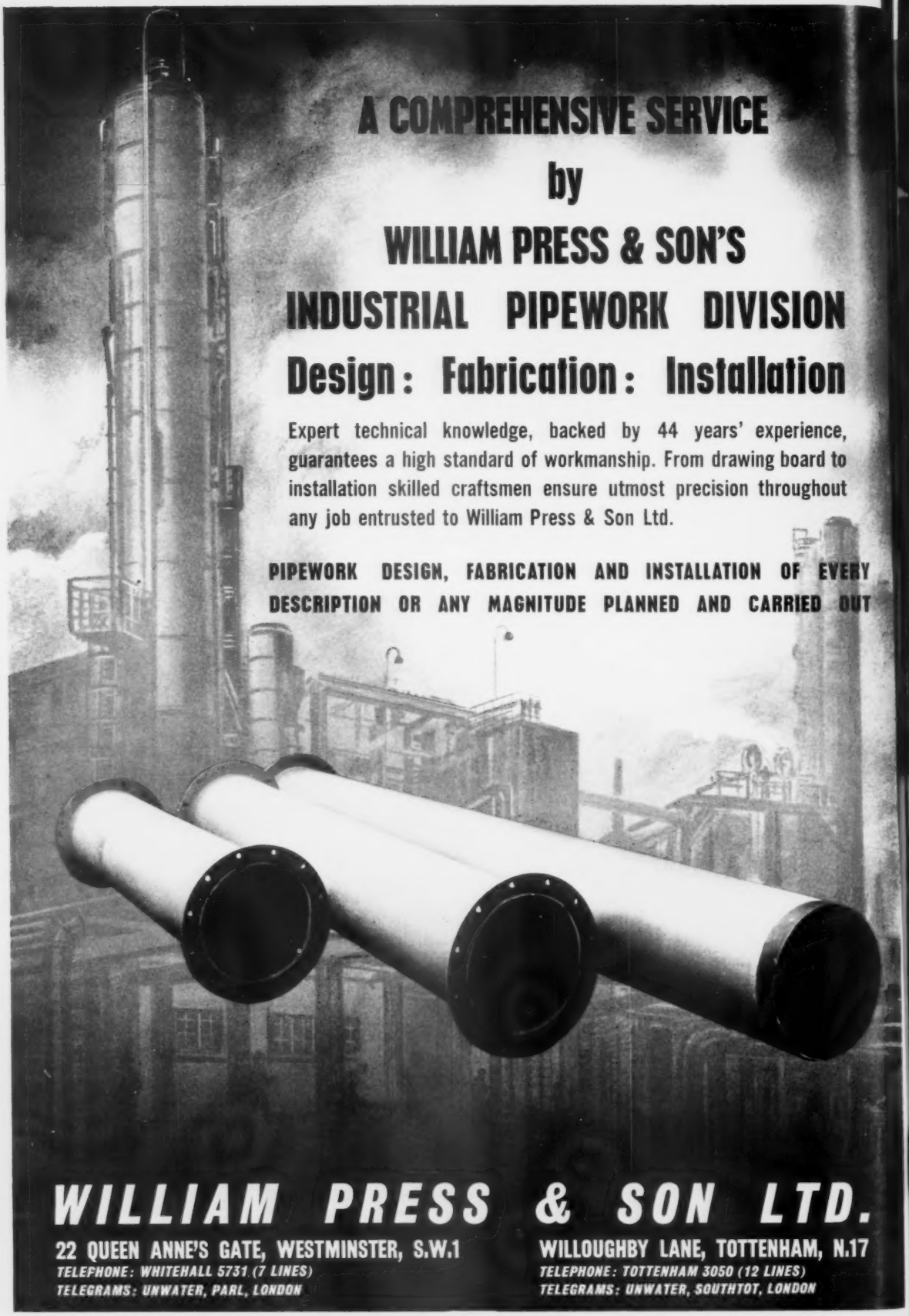

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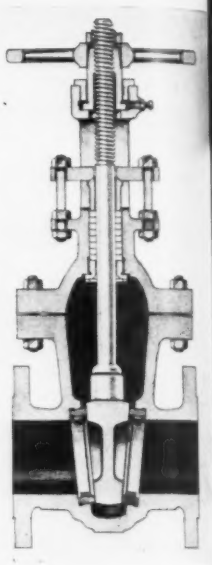
	3	7½	¾	8	5	1/16	22¾
	4	9	15/16	9	6 3/16	1/16	27
	6	11	1	10½	8½	1/16	35¼
	8	13½	1⅛	11½	10¾	1/16	45
	10	16	1 3/16	13	12¾	1/16	53½
	12	19	1¼	14	15	1/16	60½
CLASS 300	2	6½	¾	8½	3¾	1/16	20¾
	3	8¼	1⅛	11½	5	1/16	24¾
	4	10	1⅛	12	6 3/16	1/16	30¼
	6	12½	1 3/16	15¾	8½	1/16	39½
	8	15	1⅜	16½	10¾	1/16	47½
	10	17½	1⅜	18	12¾	1/16	56¾
	12	20½	2	19½	15	1/16	63¾



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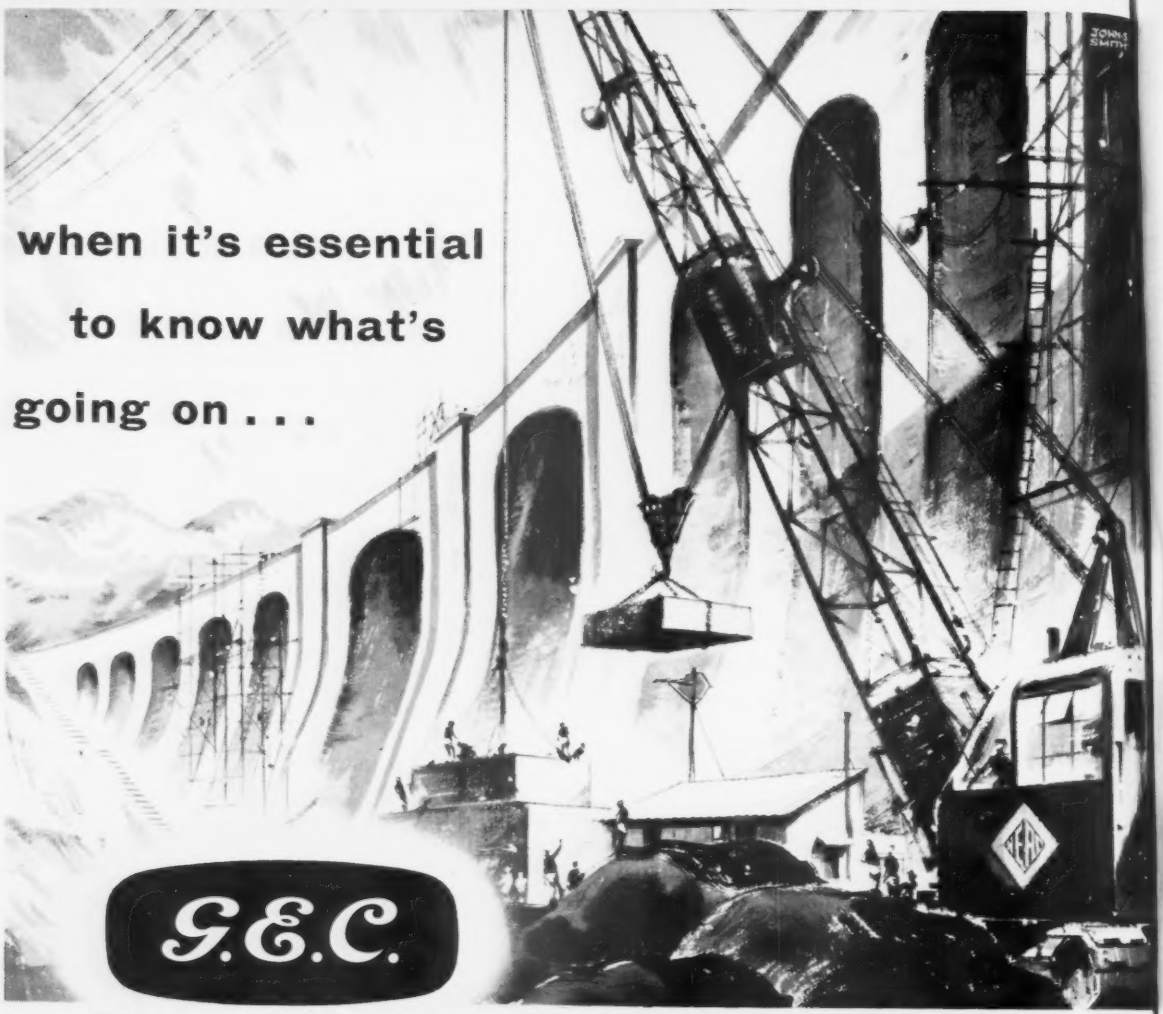

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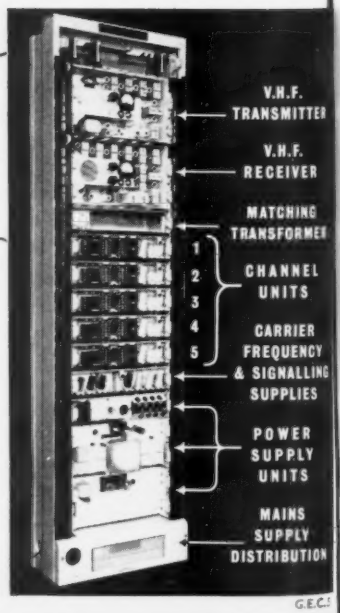

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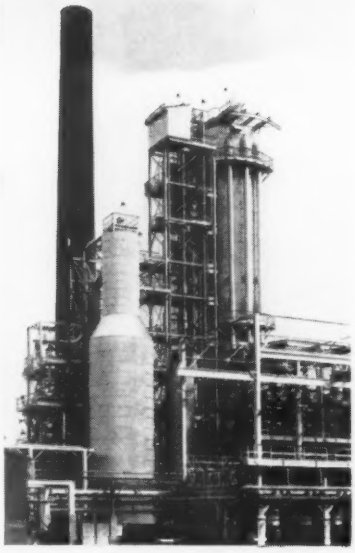

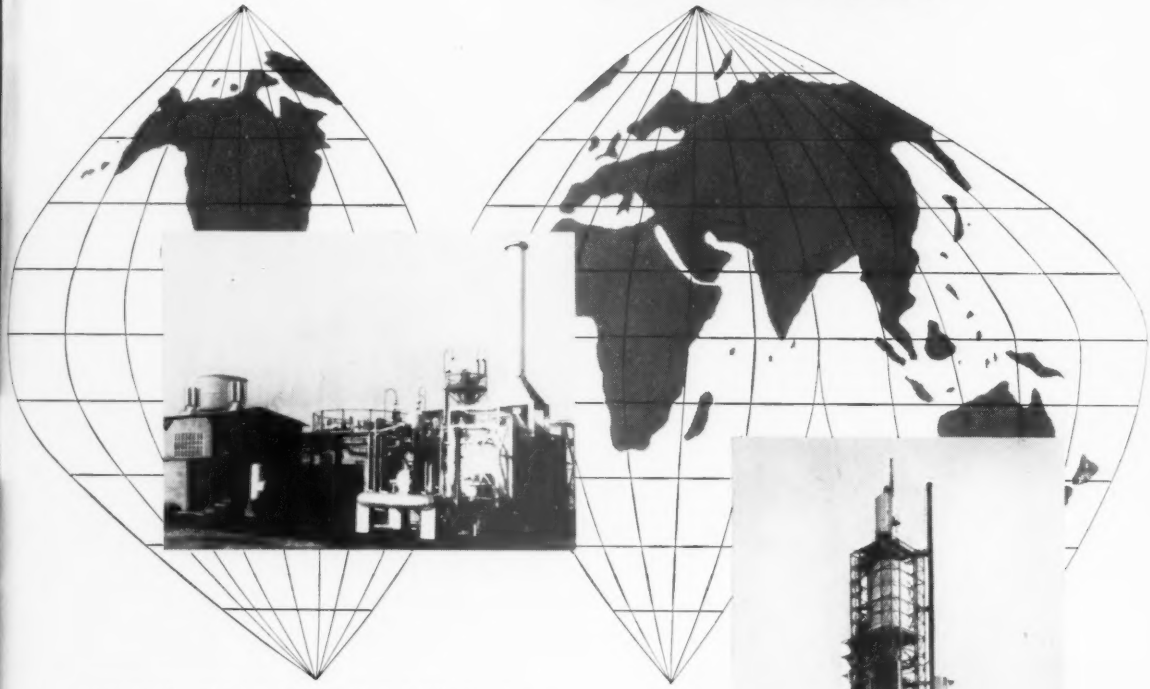

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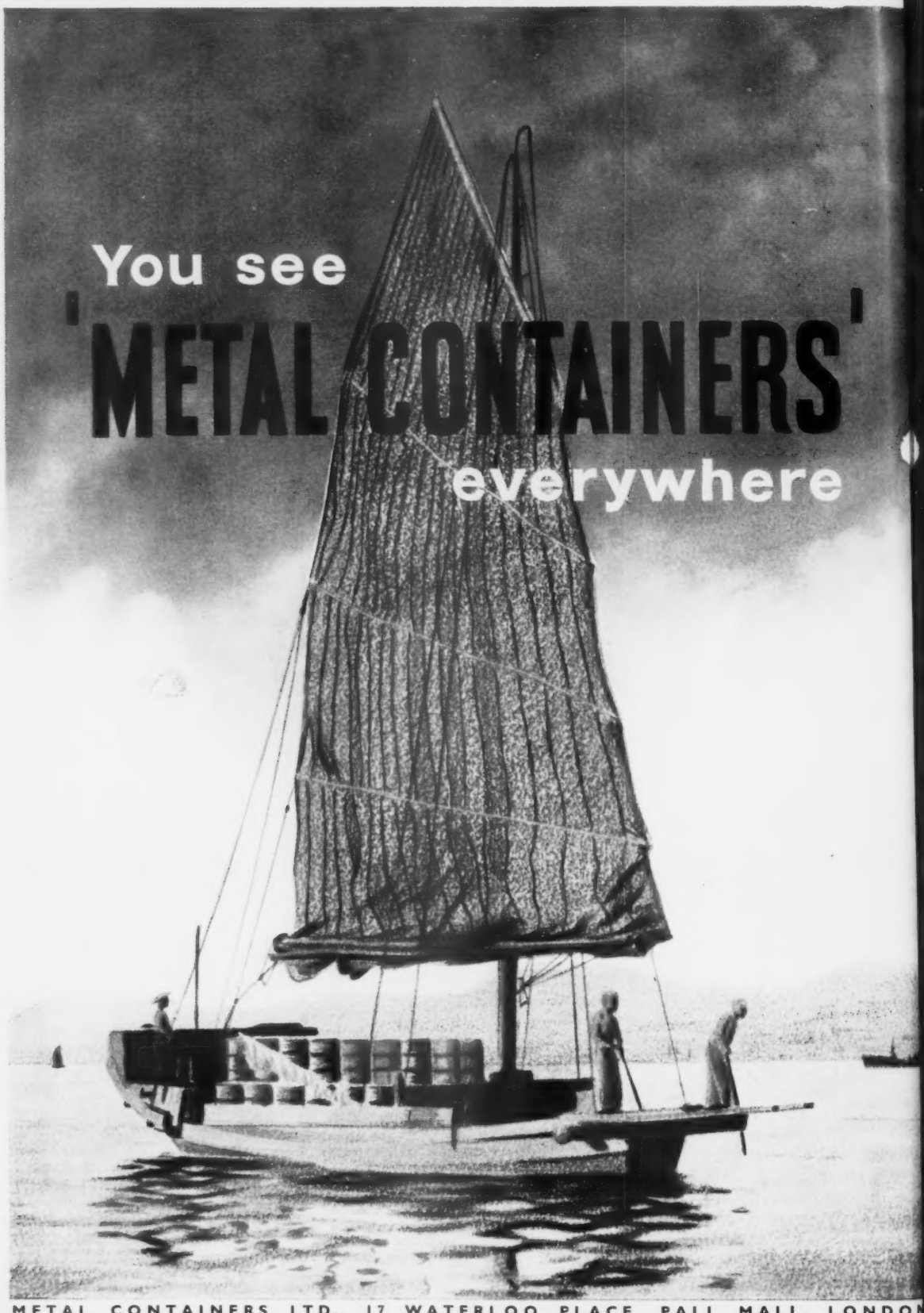

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